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VIEWS, NEWS AND INTERVIEWS.

An English exchange states that it is officially denied that Sir E. Ashmead Bartlett has obtained concessions for electrical work in Turkey on behalf of a German syndicate. On the other hand, it is asserted that he has been working exclusively in the interests of a French group headed by M. Avril. Meantime, there is no cause for surprise in the fact that the local gas companies, both at Salonica and Smyrna, have protested vigorously against their monopoly being interfered with.

The Senate has ratified a general convention with the nations participating in the Brussels Patent Conference of last year carrying out the agreement there entered into, to guarantee to the citizens of the participating nations patent rights in their respective countries.

A cable dispatch from Brussels, Belgium, dated March 28, stated that a heavy snow-storm had occurred in that city and vicinity, resulting in the complete disorganization of the telephone system. The damage done to the wires is so extensive that it is not likely that the repairs necessary to the restoration of the service can be made within a month.

Gen. A. W. Greely, chief of the Signal Service, has gone to Havana, Cuba, to confer with Colonel Dunwoody about the operation of the telegraph lines in Cuba. At present volunteers operate the telegraph service. As they are to be mustered out, a new arrangement must be made to operate the lines by civilians or by the reenlistment of the volunteer Signal Corps. It is this condition that General Greely hopes to arrange.

Six new scholarships of $100 each have been established in the Sheffield Scientific School of Yale University. They will be awarded to members of the graduating class who stand highest in scholarship.

In the course of a resolution adopted by the directors of the General Electric Company on the death of Mr. John Kruesi, the following is worthy of note:

Mr. Kruesi's ability and singular devotion to duty have always been important factors in the company's success, and the solidity of his character, as well as his unfailing courtesy and kindness of disposition, have greatly helped the company to retain the confidence and support of those having business relations with it.

According to a Philadelphia paper, Count Eugene Von Rosen, a relative by marriage of the late Mrs. Bloomfield Moore, says she gave to Keely, the "motor man," for 20 years an allowance of $250 a month, besides for many years supplying him with funds for the purchase of machinery.

A Newfoundland dog was killed by lightning in Passaic, N. J., the other day. The bolt came down the chimney, set the house on fire, passed on to the back yard, where it melted the steel chain by which the dog was fastened, and killed him.

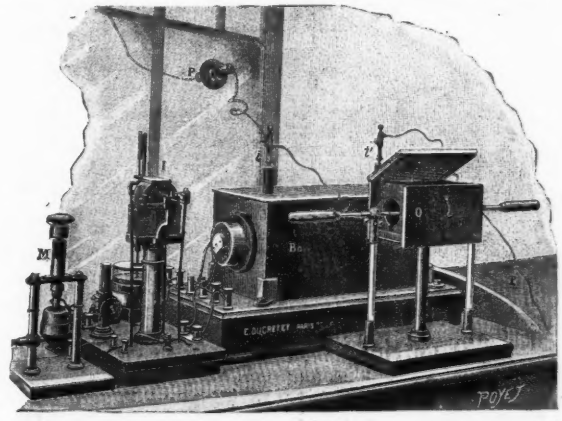


FIG. 1.—"WIRELESS TELEGRAPHY IN FRANCE"—DUCRETET'S TRANSMITTER. M, Key; I, MOTOR DRIVING THE INTERRUPTER OF THE COIL; Bo, INDUCTION COIL; i P, CONNECTION WITH MAST; O, OSCILLATOR; i' CONNECTION WITH EARTH.

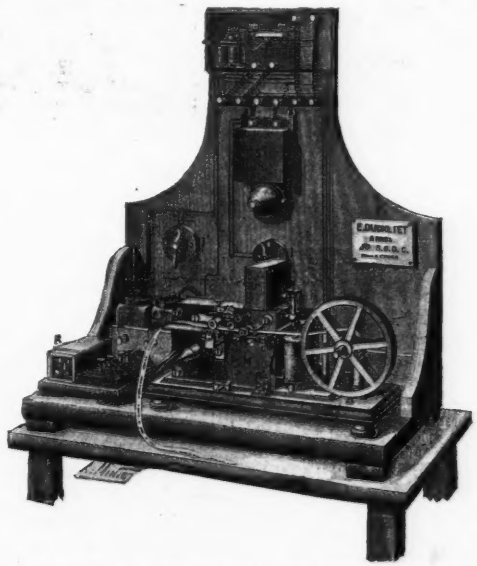


FIG. 2.—DUCRETET'S RECEIVER. Br, COHERER; F, AUTOMATIC TAPPER (DECOHERER); S, ELECTRIC BELL; M, AUTOMATIC REGISTERING APPARATUS, WITH BATTERY; R, RELAY AND CONNECTION WITH EARTH AND MAST.

WIRELESS TELEGRAPHY IN FRANCE.

That France is aware of the importance of wireless telegraphy is shown by an account of the recent experiments of M. Ducretet in Paris, contributed to *La Science Française* by M. A. Rigaut. The article, most of which is translated by the *Literary Digest* as below, gives a very good idea, in brief compass, of the results and methods of the new telegraphy. Says M. Rigaut:

"We have claimed for M. Branly the paternity of the essential feature in the receiving instrument—the 'coherer'—and we have applauded the first results obtained in France, without any aid from either telegraphic or academic authorities, by the learned and always active French inventor, M. E. Ducretet.

"These experiments are still continued, and the inhabitants of Rue Claude-Bernard have been much puzzled during the past few months by the sight of a gigantic mast rising above the house of the Hertzian telegraphist.

"This mast belongs to the first French office of telegraphy by electric waves, whose period is estimated at 50,000 per second, when the generating spark passes between spheres six millimeters (one-fourth inch) in diameter. These waves, less rapid than those of light, can be transmitted through space and affect receiving apparatus as the light waves impress our retinas.

"We will sum up briefly the arrangement of M. Ducretet's telegraphic apparatus. The mast supports one of the ends of an insulated conductor that floats in the air, while the other end communicates at P (see Fig. 1) with the pole of an induction coil and one of the spheres of discharge. The other pole of the coil is connected with the other sphere and then to earth. If the electric current passes through the coil a discharge takes place between the two spheres, which constitute what is called the 'oscillator.' Thus we have a discontinuous and oscillatory electric discharge, a source of electric waves.

"From the free extremity of the insulated conductor fixed on the mast the waves radiate. This extremity may be terminated by a metallic surface, that furnishes, together with the conductor, the requisite electric capacity. This radiating conductor is, then, the transmitter. A spring key M enables us to make the discharge short or long as in the Morse transmitter with this difference that there

is no line between the transmitting and the receiving station.

"The receiver consists of a 'coherer' or tube filled with metallic filings (Br), called by Branly a 'radioconductor,' of a model invented by M. Ducretet; this is put in communication on one side with the insulated conductor of a second tall mast and on the other with the earth. The end of the insulated conductor is the collector of the electric waves. On the other hand, the cohering tube is placed in the circuit of a battery and a very sensitive telegraphic relay R. The battery current passes in the electro magnet of the relay only when the electric waves, coming through space, traverse the 'coherer' causing it suddenly to become a conductor. This conductibility is destroyed by a slight shock, which an automatic tapper F, actuated by a magnet (like that of an electric bell), gives at the moment when the current passes. It is this discontinuous conductivity that is utilized for the collection of the waves. . . .

"As in all kinds of telegraphy, each station must have both transmitting and receiving-instruments. The mast and its insulated conductor serve, by the use of a commutator, successively as transmitting-radiator and as collecting-receiver of the waves. A portable receiving-instrument suffices for the reading of the Hertzian signals by sound; by connecting it with a registering apparatus the message may be printed on a band of paper. Such a message may be said to 'fall from heaven.'

"Experiments with these telegraphic devices have been made with the great mast in Rue Claude-Bernard, whence messages were transmitted to the Pantheon, and afterward between the latter place and the Eiffel Tower, a distance of four kilometers (two and one-half miles). These messages were always sent successfully over Paris in spite of rain and fog. At this moment experiments are on foot on the French coast, the distance between the two stations being 30 kilometers (19 miles). . . .

"Success in the transmission of messages to a distance is a function of a certain number of factors that are now well known, as communications have already been made between ships and the land.

"Military telegraphy will doubtless utilize this method of transmission in special cases.

"On the other hand, it is perhaps one of the inconveniences of the Hertzian apparatus that the receivers collect the atmospheric electric waves. An application has already been made of this in meteorological observatories. M. Ducretet, in a storm on June 11 last, collected on his registering apparatus during one hour the records of 311 atmospheric discharges. In the radioconductor used as a collector we have, then, a very sensitive and faithful registering apparatus for atmospheric discharges, and it will doubtless become a priceless instrument of observation in the field of atmospheric electricity.

"We have much to hope from such observations, for, by knowing more about the caprices of Jupiter's thunderbolts, we may perhaps succeed in harnessing these powerful atmospheric agents.

"The winds, the waters, the tides, the sun, all give us energy for nothing. M. Berthelot, in a well known address, even has predicted the utilization of the central fires of the earth in the twentieth century; but, before we do this, we shall perhaps chain up and domesticate the electricity of the atmosphere.

"Turgot said of Franklin: '*Eripuit cœlo fulmen sceptrumque tyrannis*' [He snatched the thunderbolt from heaven and the scepter from tyrants]; another Franklin may take this thunderbolt and set it to work on the earth.

"However it may be with these dreams of the future, the present offers us an application that would have seemed impossible only a short time ago, and that will always appear mysterious to the profane. Wireless telegraphy is not at present able to replace ordinary telegraphy, but it can render real service under certain conditions."

$25,000 for a Left Foot.

Prof. Joseph Hesse, organist at the Cathedral at Providence, R. I., has received a verdict for $25,000 in his suit against the street-railway company of St. John, N. B. When in that city on a vacation last Summer he lost his left foot in a runaway electric car accident.

HIGH-VOLTAGE TRANSMISSION.

BY C. E. L. BROWN, IN LONDON "ENGINEERING."

It was with much interest that I read the article on "High-Voltage Transmission" in your last week's issue. But it seems to me to give too much the impression that the first work in this direction was on the other side of the Atlantic, and quite ignore even the well known Lauffen–Frankfort power-transmission experiments. I should be sorry to detract in any way from the honor due to Mr. Scott for his very careful and exhaustive experiments in this field, and the liberal way in which they have been given to the public, but having myself made some of the earliest pioneer experiments in this line, I think I may fairly ask you to allow me the space to mention these.

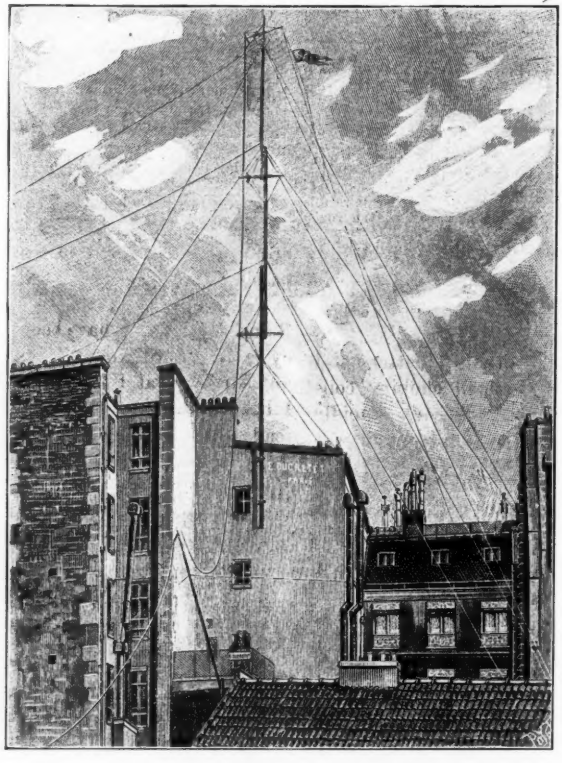


FIG. 3.—WIRELESS TELEGRAPH STATION IN RUE CLAUDE-BERNARD, PARIS.

In the Winter of 1890 I began a series of experiments with a view to ascertain what was the highest tension which could be employed for actual practical work on bare overhead wires. The transformers necessary for these experiments were immersed in oil—the first instance in practical work of this now well known method of insulation. By means of these transformers high-tension currents were transmitted over a small experimental line, and the experiments, which were continued throughout the Winter, showed that it was quite possible, under ordinary climatic conditions, to employ tensions of 30,000 to 40,000 volts on bare wires. This conclusion was communicated to the Electrotechnische Gesellschaft, in Frankfort, in a lecture which I had the honor of giving on February 9, 1891.

This is practically the result obtained by Mr. Scott in his experiments, though, of course, under the very favorable climatic conditions which he describes, it is possible as a special case to go to 50,000 volts. That atmospheric influences are exceedingly important was clearly shown by my experiments in Oerlikon, when, under specially favorable circumstances, it was possible to employ ordinary porcelain insulators from stock—intended for tensions up to about 2.000 volts—for transmission at 40,000 volts with one pole earthed. But it will be easily understood that on long-distance transmission lines—where alone such very high tensions would ever be used—it is absolutely necessary to employ such a tension as will not render the plant liable to a breakdown as a result of slight atmospheric changes. Even at some sacrifice of efficiency it is therefore desirable to go somewhat below the "knee" of the curve representing losses through the air.

There are quite a number of plants successfully at work on the continent of Europe with tensions from 10,000 to 20,000 volts. Though still higher tensions have not hitherto been actually employed on commercial undertakings, it is only because the work hitherto carried out has not, under the economic conditions prevailing on this side of the Atlantic, rendered it necessary.

The Decimal System in Our New Possessions.

[*From Science*]

American men of science should see that the decimal system of weights and measures is maintained in Cuba, Porto Rico and the Philippines. It is the first principle of colonial government to respect the customs of the native peoples, and we certainly should not fail to do this in a case where their customs are better than our own.

The American Telephone and Telegraph Company purchased 7,000,000 pounds copper wire for extensions in December last. The extensions will cover nearly all the principal parts of the United States, with additional facilities on present routes.

Practical Results with Wireless Telegraphy.

In a long paper recently read before the British Institution of Elecal Engineers, Mr. Marconi gave a number of practical points which his experiments with Hertz-wave signaling have suggested. It appears that

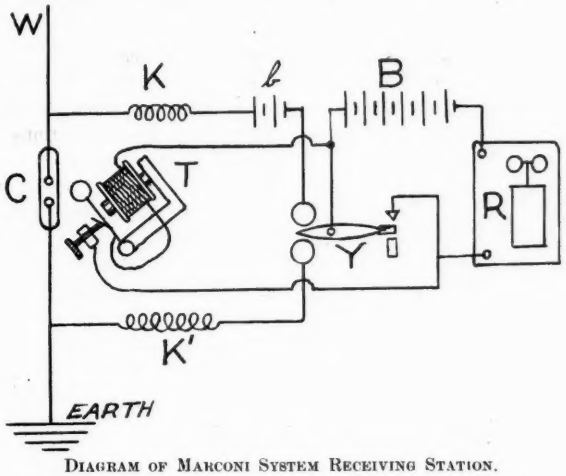


Diagram of Marconi System Receiving Station.

the best results are obtained when the signaling circuits at the terminal stations are connected to vertical conductors, the lower ends of these being earthed. The addition of a capacity, such as a hollow metallic box or sphere, at the tops of the vertical circuits seems to materially assist the working of the apparatus.

The height of the poles on which these vertical circuits are mounted is determined by a simple rule. It has been found that with poles 20 feet high messages may be successfully transmitted to a distance of one mile. Poles 40 feet high are sufficient for four-mile transmissions, and in general the distance to which a message may be sent varies as the square of the vertical height of the terminal circuits.

Over land the distances practicable are not so great as when signals are sent over a surface of water. The effect of intervening hills, trees, houses, etc , is much lessened when high poles carrying the sending and receiving circuits are employed, though no satisfactory theory to account for this fact has as yet been suggested.

Referring to the arrangement of the apparatus, Mr. Marconi has found that, for a sending station, a coil giving about a 10-inch spark is best, the discharge taking place between brass balls about one inch in diameter. This arrangement, when the balls are only about three-eighths inch apart, gives better results than the Righi oscillator formerly used. It is said to work better when the balls are dull than when they are polished. The object of using so large a coil for this short spark-distance is simply to insure a regular and steady stream of sparks.

The arrangement of a receiving station is shown in the accompanying diagram. The coherer C is connected with the vertical wire W and also to a small battery *b*. Included in the circuit with this battery and the coherer are small choking coils K and K¹, which compel the rapidly oscillating currents set up in the vertical wire to travel through the coherer rather than through the alternative path presented by the battery circuit and sensitive relay Y. The signals actuate the relay, which closes the large battery B, through a Morse recorder R and a tapper T, similar to an ordinary electric bell. This rapidly taps the coherer tube, loosening the filings contained in it, but this action is so rapid that the tongue of the relay does not have time to move, and hence the recorder makes a continuous mark while the wave signals are coming in.

To avoid the disturbances that would be set up in the coherer by sparks at the tapper contact and elsewhere through the instruments, high-resistance, non-inductive shunts (not shown in the illustration) are bridged around each gap.

This apparatus is said to have worked with much satisfaction at many places. The historical experiments between Bournemouth and Poole, a distance of 18 miles, and between Kingston, Ireland, and a steamer following the yacht races last July, by which news was telegraphed to a daily paper, are well remembered. The latest and, both in point of distance covered and probable historical interest, most important feat is the successful interchange of messages between Dover, Eng., and Boulogne-sur-Mer, France, a distance of 32 miles. This was accomplished on March 28. The length of the spark and the power of the current were the same as in the case of communication with the East Goodwin lightship, over a distance of 12 miles, a fact which seems rather remarkable when it is considered that the distance over which the messages between France and England were sent is nearly three times as great. The greater distance was compensated for by increasing the height of the transmitting pole to 150 feet.

Throughout the whole of the messages sent, though there was a thick haze in the channel and it was blowing heavily, it is said that there was not a single fault detected, every message being clearly and easily recorded. The rate of transmission was about 15 words per minute, the depression of the key being somewhat prolonged to allow of distinct spark-passing.

The opinions of some well known British electricians have been received by cable. Lord Kelvin said: "I am not surprised at the results attained. I believe wireless telegraphy has already become a practical success and its future is immense. For over sea communication it has many advantages."

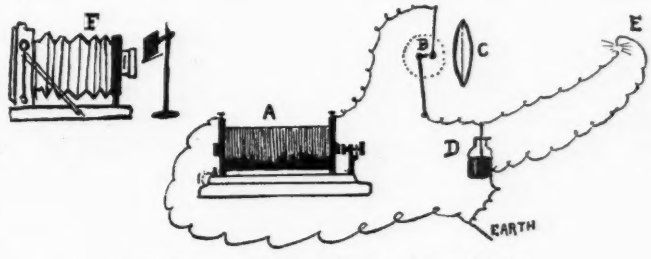
Prof. Sylvanus Thompson said: "Marconi's demonstrations are the natural development of principles propounded by Hertz and Oliver Lodge."

Mr. W. H. Preece declined to commit himself to a statement as to what future developments will be attained in the matter of distance. He concurs with Tesla that Marconi's experiments, though interesting, are not specially novel. He thinks the system will prove good for short distances, but not for signaling across extended space.

A prominent London expert, who does not wish his name disclosed, said Marconi can do nothing commercially with the system, because the transmission of messages is too slow for public requirements, and also because it is impossible to maintain absolute secrecy. Any one possessing an apparatus can receive the message destined for another person.

Photographing Sound-Waves.

Prof. R. W. Wood, of the University of Wisconsin, has made some very interesting studies on the propagation, reflection and refraction of sound-waves by means of the electrical and photographic apparatus shown in the accompanying illustration. The sound-waves used are generated by the passage of an induction-coil spark between the balls *B*. The same coil charges a Leyden jar *D*, which overflows through the spark-gap *E*, placed at the principal focus of the lens *C*. By varying the resistance and inductance of the various circuits the spark at *E* may be made to lag behind that at *B*, so that the sound-wave issuing from the latter (an approximately spherical wave) will be in the position shown by the dotted line at the instant the bright discharge of the jar takes place. The two balls at *B* are placed in the axis of the lens, and a camera *F* photographs them by the light of the condenser discharge against a brilliantly illuminated background. The sound-wave being a shell of air at a different density shows as a shaded circle on the plate.



Apparatus for Photographing Sound-Waves.

By introducing reflectors of various shapes, gratings, prisms, etc., the phenomena of reflection, refraction and diffraction are most beautifully exhibited in the photographs. It will be remembered that a similar apparatus was employed by Toepler in studying refraction variations, while Professor Boys has used an arrangement of the same kind for photographing the air-waves produced by the flight of a rifle bullet.

Success is the accomplishment of what most people think can't be done. —*C. V. White.*

ELECTRICITY AT HIGH PRESSURES.

PROF. ELIHU THOMSON'S LECTURE BEFORE THE NEW YORK ELECTRICAL SOCIETY.

At a meeting of the New York Electrical Society, held on Wednesday evening, March 29, Prof. Elihu Thomson delivered a lecture on high-voltage electricity, exhibited a number of brilliant experiments, and showed, for the first time, his novel adaptation of the Planté rheostatic machine for the production of extremely high electrical pressures.

Professor Thomson, in his opening remarks, called attention to the importance of studying the phenomena of high voltages in view of their growing application to power trans mission work. In the early years of electrical study only high pressures were known. In this connection it is worth while to speak of the prevailing, but false, idea that mere voltage is dangerous to life. It is always current, the result of a sufficient voltage backed by a sufficient amount of energy, that kills. Even an ordinary 110-volt direct-current circuit might kill if sufficient contacts with the body were made and a large enough current passed through it.

Referring to the voltage of the lightning flash, the speaker said that it varied, in his opinion, from a few to hundreds of millions of volts. To strike a mile or more, an enormous voltage is required, but the condition of the air is the determining factor in the striking distance.

A high-frequency apparatus, which Professor Thomson constructed, giving a 64-inch spark, was estimated by Professor Trowbridge to give a potential difference of about 1,000,000 volts. A similar apparatus, constructed by the latter experimenter, gave 3,000,000 volts and a seven-foot discharge.

Among methods of obtaining high voltages is that of diminishing the capacity of a system having an initial charge. For example, a film of varnish, or a thin sheet of rubber, in contact with a metal plate, and having a charge of very low tension, due to mere contact, becomes charged to a tension sufficient to cause a one-inch spark when removed from the metal—that is, when the capacity of the system, considered as a condenser, is decreased.

A similar phenomenon takes place when similarly charged globules of moisture are brought into contact or near each other. The outer ones shield the inner ones, the charge of the system gathers on the outer layers, and, the capacity being decreased, an elevation of voltage is the result. The old steam machine, or "hydro-electric generator," took advantage of this principal for its action.

In the same way, an ascending current of warm air, having a definite electrification, enters a layer of moisture-laden air, which it condenses into minute drops, the whole taking a puffed or globular shape, and the voltage of its outer layers mounting up until it is sufficient to strike to earth in the form of lightning.

A very fine Holtz machine was shown and compared to the electrophorus. While such machines are admirable for working X-ray tubes, it is questionable if they have any direct value in the treatment of disease.

Another method of attaining high voltages is by transformation, so fully elaborated in connection with modern lighting and power-transmission installations. In his early days, Professor Thomson said, he had often wondered if he would live to see a powerful current at a voltage high enough to "strike." This is now in daily use, as pressures up to 40,000 volts—a voltage that will readily strike two inches—are utilized for power transmission. There is, however, a limit beyond which it does not seem feasible to work aerial transmission circuits. At about 50,000 volts a blue discharge, or leak through the air begins to take place. The capacity of the line also begins, at these high voltages, to play an important part.

After speaking of the increasing size of transformers and other power-transmission machinery, the lecturer spoke of another method of attaining great electrical pressures—by varying the rate of change in currents.

This was accomplished in the old-fashioned induction coil by electro-magnetic, or mechanical, circuit-breakers in combination with condensers As the condenser discharge surged through the primary of the coil, such instruments really produced high-frequency effects. The new Wehnelt electrolytic interrupter was described and exhibited, the lecturer creating no little amusement by so varying the note of an interrupter as to make it sound a familiar hymn-tune. Professor Thomson is better as an electrician than as a musician!

A wooden box, containing a coil connected with one of these interrupters, was also shown, the rate of interruption being varied until a resonant effect was obtained, and the box roared in deafening fashion. This was suggested as a possible substitute for the steam-whistle.

High-frequency apparatus, the extreme method of raising voltage by varying the rate of charge of current, was shown and briefly described.

In conclusion Professor Thomson exhibited an important modification of the Planté rheostatic machine. This apparatus consists of a series of condensers adapted to be charged in parallel and connected in series for discharge. In former experiments with such apparatus it has been customary to charge the condensers from a battery of many elements, Professor Trowbridge having used 10,000 cells in his researches with it. Naturally this is a costly and troublesome arrangement. The new apparatus shown consisted of a rotary converter of small size, operated by direct current, and giving a single-phase alternating secondary having a maximum instantaneous voltage of about 110. This current was led through a step-up transformer, giving an instantaneous maximum in its secondary of 15,000 volts. An adaptation of the Lemp selector, driven synchronously by the motor-converter, connected, so to speak, the crests of the waves in one direction, with a battery of 11 small glass plate condensers in parallel, the next half-revolution of the apparatus discharging them in series. With this machine a fine shower of heavy 12-inch sparks was easily maintained, while with more and larger condensers a still higher voltage and more powerful discharge could be easily reached. The problems of high-pressure electricity are becoming more and more important, not only to the electrician but to the meteorologist and astronomer as well. The aurora is evidently an electrical phenomenon, and the lecturer closed his remarks with the suggestion that it might be due to the earth's encounter with some stream of electrical radiation or influence from the sun—some stray streamer of the solar corona.

A vote of thanks was tendered the speaker by the large and appreciative audience present, and after some graceful remarks by President Gano S. Dunn the meeting adjourned.

Municipal Ownership of Street Railways in Detroit.

The Common Council of Detroit, Mich., on April 1, by a vote of 21 to 11, appointed a commission, headed by Governor Pingree, to negotiate, purchase and operate all the street railways of Detroit under municipal ownership.

The Wehnelt Current Interrupter.

There are few people that have worked and experimented with induction coils (especially in connection with X rays), who have not had their patience tried by the erratic irregularities of the ordinary interrupter or "vibrator," which will often change its note, or suddenly stop at some critical moment without warning or any apparent cause.

A new current interrupter of reliable character and steady habits can not fail to meet with a cordial welcome. Such an apparatus is the Wehnelt current interrupter. The principle of its operation is that of the well known electric forge, but with a reversed current action.

Dr. A. Wehnelt, of Berlin, Germany, very cleverly conceived the idea of using this device as a current interrupter for induction coils, and the results thereby attained have fairly electrified the scientific world.

The cut here presented, Fig. 1, illustrates the apparatus in a practical form, and shows the extreme simplicity of its construction.

A round glass jar, three or four inches in diameter, and four or five inches deep, is fitted with a cover of wood or hard rubber. A piece of sheet lead is rolled into a cylinder that will slip into the jar, and is connected to a binding-post on cover in any suitable way. In the center of the cover is a hole about an inch in diameter, into which is fitted a perforated cork. Passing through this cork is a glass tube, which has a small platinum wire sealed into its lower end. At the upper end of this tube is a binding-post, into which a copper wire is soldered. This copper wire reaches nearly to the bottom of the tube and connection between it and the platinum wire is made with quicksilver.

Four round holes, about an inch in diameter, are cut in the lead cylinder to enable the operator to see the platinum point.

The pieces are assembled as shown in the cut, a mixture of five parts water (by measure) with one part sulphuric acid is poured into the jar to a convenient level, and the apparatus is ready for action.

In using the interrupter with an ordinary induction coil, the screw of the vibrator should be turned up to close the platinum contact points and short-circuit the condenser, as the new interrupter does not require the assistance of any condenser, and it works better "on its own hook" without one. A special feature of

advantage which this interrupter possesses over the ordinary vibrator is that it permits the use of the 110-volt direct current that is supplied for lighting purposes without any change

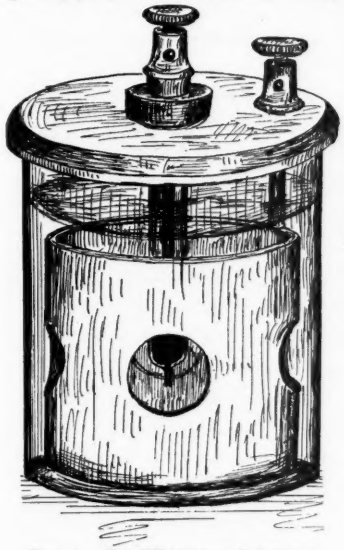


FIG. 1.—THE WEHNELT CURRENT INTERRUPTER.

in the coil winding or any accessory apparatus excepting, perhaps, a simple water rheostat.

The connections can be made as shown in Fig. 2, and when the current is turned on the experimenter is usually surprised, if he is witnessing the operation of the interrupter for the first time.

Under certain conditions a thick, flaming discharge will be produced between the terminals of the coil that undulates like a fiery serpent and emits a singing noise. Under other conditions the discharge will be in the form of a brilliant torrent of silvery blue sparks, and sometimes there will be a combination of the two phenomena. A water rheostat is not an absolute necessity, because the size and length of the projecting platinum wire limits the amount of current flowing, but it will be found very convenient for regulating purposes.

A cheap and practical rheostat may be made with two sheets of tin-plate, 10 or 12 inches square, suspended in a suitable vessel containing a solution of common washing soda. Varying the strength of the soda solution, or the distance between the plates, or the amount of immersed surface of one or both of the plates, will produce corresponding regulation of current effect.

Having now broadly described the construction and application of this interrupter, it may perhaps be desirable to add a few remarks touching details.

The glass tube that carries the platinum wire or "anode" is, of course, the most important part of the interrupter, and it should be made with intelligent care in view of the particular kind of service that it will be required to perform.

If it is intended for use with a large coil and a correspondingly heavy current the platinum wire should not be smaller than No. 20 Brown & Sharpe. In operation it will be considerably heated by the passage of the current, and in order to draw off the heat as fast as possible, as well as to provide convenient connection between it and the copper wire, the tube is partly filled with quicksilver. The bore of this tube may be one-fourth inch or larger.

If it is comparatively small, and the current is to be heavy, the lower end may be blown into a bulb, and two or more platinum wires may be sealed into the sides (Fig. 4, *d*). If these wires project only a short distance on the outside of the bulb, they will each carry a fractional amount of the total current flowing, thus reducing the individual heating effect, yet working all together as a unit.

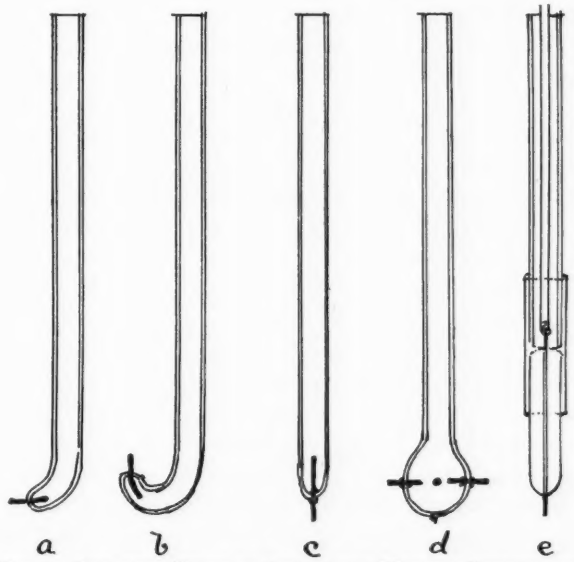


FIG. 4.—DIFFERENT FORMS OF ANODES FOR WEHNELT INTERRUPTER.

Such precautions as these are of course unnecessary when the interrupter is to be used with a small coil and comparatively light amount of current. In such cases the platinum wire may be soldered to the copper wire, and the quicksilver dispensed with.

The utility of fitting the glass tube into a large cork in the center of the cover will now be apparent, as this construction will permit a number of different tubes to be made and readily interchanged to meet any required condition of service.

A great deal of experimenting has been done to determine the best shape for the "anode." It would most naturally be inferred that a shape like *b*, Fig. 4, would operate the best, as it would seem to offer the least resistance to the escape of the liberated gases. It is a curious fact, however, that the position of the platinum wire in relation to the glass tube appears to have very little effect on the operation of the interrupter. If there is any choice, *c*, Fig. 4 (apparently the least desirable) seems to produce the best results. For those who wish to experiment in this line, and have not the facilities or skill required for sealing the platinum wire into the glass tubes, the following suggestions may be useful:

Procure some thermometer tubing, into which a No. 20 B. & S. platinum wire will fit snugly. Break this tubing into pieces about one and one-fourth inches long, and round off the ends with a file. Thread in pieces of platinum wire long enough to extend one-fourth inch at both ends.

A piece of thin glass tube of about the same outside diameter as the thermometer tube can then be attached with a small piece of soft rubber tubing (*e*, Fig. 4). Quicksilver can be poured in for connection between platinum and copper wires, or the copper wire may be soldered to the platinum and no quicksilver used.

The upper end of the thermometer tube should be warmed, and a little sealing wax applied to prevent the dilute acid from creeping up past the joint. By using this construction it is easy to vary the length of the platinum anode without wasting any metal, which will be appreciated as a convenient feature when platinum wire is scarce. Fig. 3 illustrates another form of interrupter in which the cathode is a flat plate instead of a cylinder, and the containing vessel a rectangular jar.

Centrally opposite the lead plate a hole in the containing vessel is fitted with a perforated rubber cork, through which is passed a piece of the thermometer tube before described, and which projects about one-half inch inside the jar. Over the outer end of the glass tube is fitted a rubber cap.

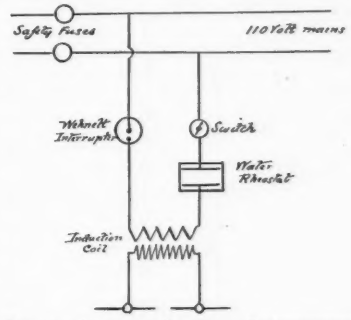


FIG. 2.—DIAGRAM SHOWING CONNECTIONS FOR WEHNELT INTERRUPTER.

A piece of platinum wire is pushed through this cap into the thermometer tube until the end projects into the jar.

The platinum wire should make a good snug fit into the glass tube, but it could not fit accurately enough to prevent leakage of acid, so the rubber cap is used for this purpose.

The amount of exposed platinum surface can be conveniently regulated with this arrangement, which will be found useful for experimental purposes.

The principal objection that has thus far been raised against the new interrupter is its inefficiency.

This defect can not be denied, but it is counterbalanced by many good

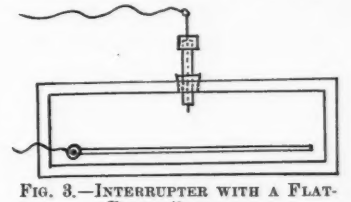


FIG. 3.—INTERRUPTER WITH A FLAT-PLATE CATHODE.

qualities that are lacking in ordinary mechanical interrupters and vibrators, as already referred to.

The fumes given off by the dilute acid are also very objectionable if allowed to escape into the air, but they can be easily carried away or neutralized by simple and cheap contrivances.

The energy lost in the interrupter is transformed into heat, so that the acid solution rapidly warms up when a heavy current is used.

After a certain temperature is reached the operation of the interrupter is impaired, and at a higher temperature it ceases altogether.

Means must therefore be provided for cooling off the apparatus when continuous action is required. A simple and obvious way to do this is to set the containing vessel in a bowl of cold water, and change the water when necessary or cool with ice. Care must be taken to connect the platinum wire to the positive pole of the circuit, and the lead plate to the negative pole, for if this arrangement is reversed, the platinum wire will probably be melted off.

Electrical Review

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CONTENTS.

Views, News and Interviews..... 209
Wireless Telegraphy in France..... 209
$25,000 for a Left Foot..... 210
High-Voltage Transmission..... 210
The Decimal System in Our New Possessions... 210
Practical Results With Wireless Telegraphy.... 211
Photographing Sound-Waves..... 211
Electricity at High Pressures..... 212
Municipal Ownership of Street Railways in Detroit..... 212
The Wehnelt Current Interrupter..... 212
High Pressures and High Frequencies..... 214
Electric Control of Torpedoes..... 215
Personal..... 215
Rocks on the Gorge Road Tracks at Niagara Falls..... 215
Fire in a New Jersey Telephone Exchange..... 215
Wall Street and the Electrical Stock Market.. 215
An Electric Power and Light Exposition in Texas..... 215
A Simple Wehnelt Interrupter..... 216
New York Electrical Society..... 216
An Alternating-Current Ventilating Fan Outfit. 216
The Problem of Electrolysis..... 216
Electric Fixture Combination..... 216
Telephone Service in Canada..... 216
Isolated Plant for the Capitol Building at Albany, N. Y..... 216
The Emerson Electric Manufacturing Company's Alternating-Current Fan Motors..... 217
The "Independent" Telephone Combination... 218
The Views of a Number of the Leading Telephone Manufacturers on the Question of Consolidation..... 218
Traffic Arrangement Between the Third Avenue and Elevated Railroads in New York..... 219
A New Incandescent Lamp Reflector..... 219
The New York Electrical Exhibition..... 219
Advertising Pointers..... 219
Chicago Electrical Trade News..... 220
Exhaust Steam Mains in Cities..... 220
J. H. Bunnell & Company Secure an Injunction on Primary Batteries..... 220
Business Notes..... 220
A New Expansion Circuit-Breaker..... 221
A Boston View of Wall Street Expansion..... 221
Electrolytic and Lake Copper..... 221
Obituary..... 221
Foreign Electrical News..... 222
General Electric Company Entertains Editors.. 222
Electric Stocks..... 222
True Meaning of the "Ellsworth Amendment" and Erroneous Statements Corrected..... 223
Columbus Street Railway..... 223
New Buildings of the General Electric Company at Schenectady, N. Y..... 223
St. Louis World's Fair..... 223
Advance Information..... 224
Electrical Patents..... xix
Industrial Notes..... xix
Kindred Interests..... xx

Advertisers' Alphabetical and Classified Index on page xvi.

If the Nernst lamp will accomplish even the half of what is claimed for it, a long step has been taken towards the solution of a difficult problem—the use of large-power direct-coupled dynamos for street lighting. Far the largest part of street arc circuits are to-day worked from small, mechanically inefficient belted machines. If dynamos of 500 kilowatts, say, could be used on them (and this the new lamp seems to make a possibility), these could be direct-driven, reducing friction losses and floor space to a minimum.

The ELECTRICAL REVIEW takes pleasure in informing its readers that Mr. Charles T. Child has been appointed to the position of technical editor on its staff. We have also made several additions to the business staff and are glad to state that we are in a better position than ever to be of service to the electrical field in every sense. Mr. Child is well known as a technical writer in the electrical field, having been for some time the editor of the *Electrical World*, and of late on the editorial staff of the *Engineering Magazine*. Mr. Child is a graduate in the electrical engineering course of Johns Hopkins University and has had a great deal of practical experience as an electrical engineer. We bespeak for him the same courtesy that has always been extended to the staff of the ELECTRICAL REVIEW by the fraternity at large.

The new Wehnelt electrolytic current interrupter, just now attracting so much attention, holds out some shadowy promises of possible commercial importance. It is, perhaps, the best device yet produced for interrupting the primary circuit of an induction coil, and it may prove of use in connection with other minor applications of electricity. But it is of immense importance as a means of obtaining currents of frequency intermediate between those given by the familiar alternator and what are called "high-frequency" currents. This vast range of frequencies is an undiscovered country. What phenomena, beautiful or useful, may be brought to light in it, and what rewards will be reaped by the eager experimenters in this new field, can only be surmised. It is, at least, certain that Dr. Wehnelt's discovery is an important contribution to the equipment of the physicist and electrician.

HIGH PRESSURES AND HIGH FREQUENCIES.

There is no department of electrical study so fascinating as that dealing with high pressures and frequencies. While the first knowledge of electricity came through the study of high-pressure phenomena, interest in these waned and almost disappeared after the introduction of current electricity as a working force. The almost incredible development of knowledge in this department, the great industrial evolution it accomplished, the vast benefits arising from the completion of each step in advance, so accelerated the progress of the electrical arts that, to-day, application of the ordinary forms of electric current—direct, alternating, polyphase—may almost be said to be a finished subject. Its era of rapid progress is passed; it can only improve by the little betterments of detail suggested by experience.

But the really great field of electrical study remains, for the most part, unexplored. It is to electricity at high pressures and at high rates of vibration, or both, that we must look for new progress. So little is known of the beautiful phenomena of electrical action under such circumstances, so much can be imagined, that the least attempt at prophecy is dangerous.

The very few enthusiastic investigators who have left the beaten track to explore this fascinating region have already produced amazing results. In these pages, last week, was an account of the remarkable work of Mr. Tesla with currents of high potential and frequency. Such results as this patient and earnest experimentalist in the field of science has accomplished lie so far without the range of usual experience that no comparison of other results with them is possible. They stand apart, and it must be left to the future to judge of the value of their accomplishment.

Still, it is certain that every new fact of Nature discovered is finally beneficial, whether or not its utilitarian application is immediate. There seems vast promise in the new facts that Tesla presents; still vaster possibilities lie scattered through the new and interesting field to which he points. To this work must be given the large credit due to any effort to add to the world's store of knowledge. Its results may not always be immediate, but they can not fail to be extremely valuable — perhaps even revolutionary.

There are a few old people who can still remember the fear with which gas and gas-pipes were regarded in their early days. For a long time after its introduction every mysterious fire was charged to gas. This has been forgotten since electric lighting has become so general, but the necessity for something to bear the burden of mystery has weighted electric-lighting systems with many an undeserved charge of responsibility. It was even suggested, a few days since, that the recent fatal burning of the Windsor Hotel was due to a general accident to the wiring in it, setting fire to the building in many places at once. This sort of thing would be absurd if it were not mischievous. Just such ridiculous statements have caused the electrical industries untold losses.

The urgent need for a Pacific cable is bringing to light some interesting and important facts. A cable, touching only on American ground, between San Francisco and Manila would have one section—from the Hawaiian Islands to Guam, in the Carolines—longer than any submarine cable now in existence. It is 2,089 nautical miles from San Francisco to Honolulu, a distance comparable to the 2,755 miles separating Sandy Hook from Fastnet. From Honolulu to Guam is about 3,200 nautical miles. If a cable were laid over this course its cost would be enormous and its speed of working necessarily slow. It is also said to be open to question whether there is enough gutta-percha in the world to make it. Is it not time for some one to revive the land line project, for which surveys were once actually undertaken? This route, via Alaska, Bering Strait, Kamchatka, Korea and the Japanese archipelago, would involve no cables over a few hundred miles in length, and would be both cheaper to build and easier to

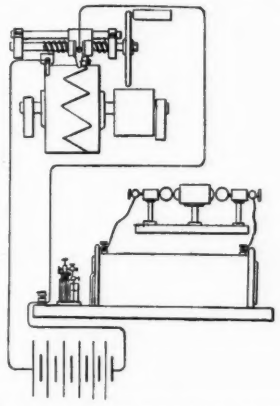
work than the trans-Pacific cable. It would be of little value in war, but, for that matter, cables were dragged up from the sea bottom last Summer and cut, and a 7,000-mile stretch is almost as vulnerable as a land-line.

The English Channel has been successfully bridged with a "wireless" telegraphic dispatch, as described elsewhere in this issue of the ELECTRICAL REVIEW. The somewhat enthusiastic friends of this variety of signaling are exulting at this first, and successful, attempt to connect the telegraphic systems of two great countries by means of the ether-wave signals, but the experiments seem more interesting than useful. Communication has been established between the termini, Dover and Boulogne-sur-Mer, and, incidentally, with any other place in the vicinity of either where any one may please to erect a pole and a coherer. It has worked, and doubtless will continue to work well, until some one operates an induction coil in the neighborhood of either station, or until a thunder-storm develops somewhere within 100 or 200 miles. It was a most interesting experiment, and demonstrated that Hertz waves of sufficient power can be detected at considerable distances. It has not as yet, however, caused any marked fall in the shares of cable companies.

The daily press is responsible for the statement that the officers of the Brooklyn Rapid Transit Company regard the rumor of an arrangement with the Metropolitan Street Railway Company, of Manhattan, for the operation of through cars over the two systems as premature. So it may be; but there is no difficulty whatever in arranging the cars of either system to work over the other. Naturally all would need to be provided with trollies, since the Brooklyn lines use overhead conductors, while those in Manhattan operate by the conduit system. A similar arrangement is in daily use in Washington, D. C., where cars coming in from a long over-head conductor suburban line are run over a pit at the city limits, and receive plows enabling them to continue their journey through the streets. The change requires only a few seconds. Of course we shall some day have through service; the sooner the better. But will it not be after the Brooklyn lines are equipped with conduits rather than before?

Electric Control of Torpedoes.

A British patent has just been issued to L. & C. J. Varicas for an apparatus for the electric control of torpedoes, etc., from a distance. The illustration shows the method of steering by the use of a transmitter producing electric waves, and a receiver in which a coherer is used. The rudder is normally held so as to



ELECTRIC WAVE CONTROLLER FOR TORPEDOES.

turn the torpedo in one direction, while a mechanical device controlled by electric current (which passes through the coherer when under the influence of electric radiation) serves to turn the torpedo equally in a reverse direction, so that when the periods of radiation and inaction are of equal length the sum of the movements of the rudder result in motion on a sinuous line, but generally in a forward direction. When it is desired to deflect the torpedo from its course in one direction or the other, it is only necessary to alter the relative duration of the periods of inaction and radiation at the transmitter, and this is effected by means of lateral adjustment of the contact arm, which bears upon the periphery of a rotating periodic contact drum.

Mr. Edward Lloyd Cooley, formerly of Boston, who has for a number of years been associated with the General Electric Company in Philadelphia, has accepted the appointment of general manager in the New England States for the C & C Electric Company, with offices in Boston.

PERSONAL.

Mr. Luther Stieringer, of New York city, has been enjoying a vacation at Atlantic City, N. J.

Prof. Elihu Thomson spent a few days of last week in New York city, accompanied by Mrs. Thomson.

Mr. Geo. A. McKinlock, president of the Central Electric Company, Chicago, is visiting New York city.

Mr. Henry C. Adams, Jr., secretary of the Phillips Insulated Wire Company, of Pawtucket, R. I., was a visitor in Chicago last week.

Mr. Jas. H. Boss, president of the Lakon Company, Elkhart, Ind., was at the Hotel Imperial, New York, for several days during the past week.

Mr. H. L. Shippy, secretary of the John A. Roebling's Sons Company, returned to New York city last week after a vacation pleasantly spent in Florida.

Mr. Henry Graftio, engineer of Ways of Communication for the Russian Government, is staying at 19 West Ninth street, New York. His visit to the United States is in order to study American electric traction systems and apparatus with a view to making a report to the Imperial Department of Railways.

The many friends of Col. Robert Stewart, Superintendent of Telegraph of the Central Railroad of New Jersey, and district superintendent of the Western Union Telegraph Company, will be pleased to learn that he is rapidly convalescing from the effects of a severe attack of pneumonia from which he has been suffering for the past month. He has gone to Asheville, N. C., to rest and recuperate.

Rocks on the Gorge Road Tracks at Niagara Falls.

About 100,000 tons of rock fell from the cliffs above the Whirlpool Rapids at Niagara Falls, N. Y., on March 31 and covered the tracks of the Gorge electric railroad. The tracks are buried, one boulder alone weighing about 200 tons. Between this boulder and the cliff there is a big mountain of shale, which was the resting place of the limestone ledge at the top of the bank. The Gorge road has not been running this Winter.

Fire in a New Jersey Telephone Exchange.

Crossed wires set fire to the office of the Elizabeth, N. J., Mutual Telephone Company on April 2. The flames were confined to the cable house, but they ruined all the connections and temporarily suspended the business of the company. The loss is put at $4,000.

Wall Street and the Electrical Stock Market.

The average daily transactions on the New York Stock Exchange during the current week were upward of 1,000,000 shares. The week's market reflects a revival of speculative interest, tending slightly toward the reckless. No great changes in the standard class of securities resulted. Following the publication of the bank statement on Saturday the whole market advanced rapidly, with Manhattan Railway, of New York, as the feature. At one time this stock showed an advance of 15 points from the closing price of Thursday, and it closed to-day at a net gain of 9 points. The rise was on rumors that an arrangement had been made between the Third Avenue R. R. Company and the Metropolitan Street Railway Company by which the latter would furnish electric current to the former.

On the New York exchange, General Electric closed to-day at 116½ bid and 117 asked, a loss of 1⅜ points for the week. Metropolitan Street Railway, of New York, closed at 265 bid and 265½ asked, a rise of 9 points for the week. Third Avenue Railroad, of New York, closed at 224 bid and 226 asked, a rise of 17 points for the week.

On the Boston exchange, American Bell Telephone closed at 368 bid and 370 asked, a gain of 3 points for the week. Erie Telephone closed at no bid price and 95 asked, a loss of 1 point for the week.

On the Philadelphia exchange, Electric Storage Battery common closed at 156 bid and 159 asked, a loss of 6 points for the week. Union Traction closed at 40¾ bid and 41 asked, a rise of 4½ points for the week.

Wall Street, April 1.

An Electric Power and Light Exposition in Texas.

An electric exposition will be held at Austin, Tex., for 10 days, beginning April 19, in honor of the annual meeting of the Southwestern Gas, Electric and Street Railway Association. This body is an amalgamation of the Texas Street Railway Association with the Texas Gas and Electric Association. It is to be attempted to make the exposition permanent, as Austin has remarkable water-power facilities, the development of which has already cost over $2,000,000, and a fine electric supply station. A number of interesting papers will be read at the meeting of the association.

Space and power will be furnished free to exhibitors. Mr. E. L. Wells, Jr., Marshall, Tex., can supply all necessary information.

A Simple Wehnelt Interrupter.

Mr. E. Bennet Viles, writing to our London namesake, says that if, in the Wehnelt interrupter, a large globule of mercury is substituted for the lead plate, distilled water for the electrolyte, and an aluminum wire for the anode, the apparatus will work well when the wire is brought close enough to the mercury to form a small arc under the water. The mercury must not be too clean and the anode must be of aluminum.

New York Electrical Society.

At the meeting of the New York Electrical Society on March 29, the following members were elected:

Theodore Boran, F. C. Bates, R. H. Proctor, G. H. Seward, Philip R. Backus, Edward L. Reynolds, Harcourt Lee, R. R. Reed, S. L. Nicholson, Henry O. Pond, I. Walter Ullman, Jefferson Wetzler, E. M. Beane, William Yeager, Frederic G. Sykes, C. S. McCalla, Cabot Stevens, Randall D. Warden, Hawthorne Hill, L. J. McDowell, Ernest Woltman, S. Edward Eaton, A. L. Holt, William Maver, Jr., A Livingstone Bogart, Frederic Woodhull, Dr. Samuel Sheldon and Peter Cooper Hewitt.

An Alternating-Current Ventilating Fan Outfit.

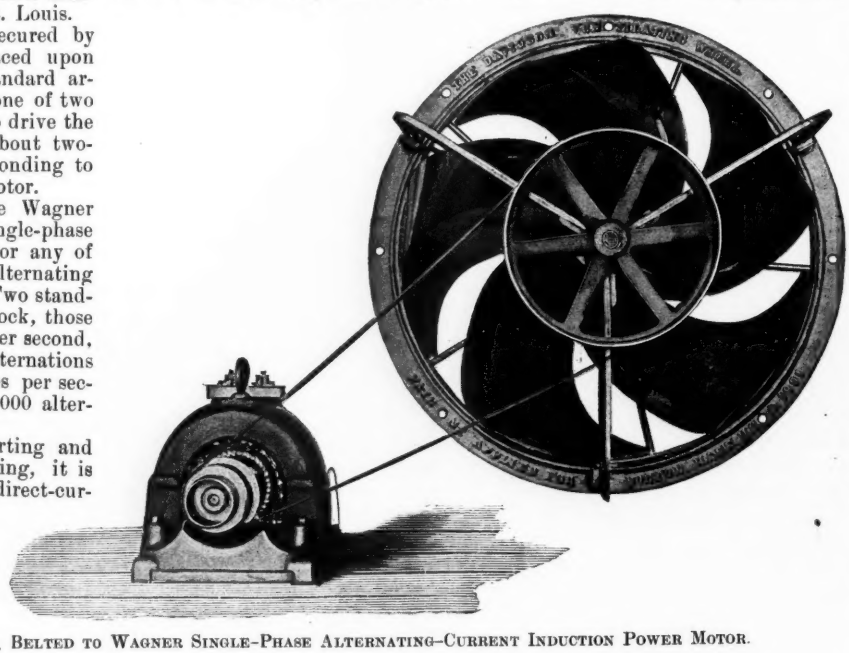
The ventilating fan outfit illustrated herewith is composed of a Wagner single phase alternating current induction motor belted to a Davidson fan, and is placed upon the market by the Wagner Electric Manufacturing Company, of St. Louis.

Speed adjustment is secured by means of cone pulleys placed upon the motor shaft. The standard arrangement has a speed cone of two steps, so proportioned as to drive the parts at full speed and about two-thirds speed, these corresponding to full and half-load on the motor.

The motors are of the Wagner standard, self-starting, single-phase type, and can be wound for any of the several frequencies of alternating current in general use. Two standard types are carried in stock, those for a current of 60 cycles per second, corresponding to 7,200 alternations per minute, and 133 cycles per second, corresponding to 16,000 alternations per minute.

The motors are self-starting and entirely automatic, requiring, it is said, even less care than direct-current machines. The motors may be run from single-phase circuits or from either phase of two or three-phase circuits. While the standard windings are for 104 volts, the motors may be wound for either 208 or 500 volts as desired.

FIG. 1.—EMERSON ALTERNATING-CURRENT FAN MOTOR WITH ARMATURE REMOVED.



VENTILATING FAN, BELTED TO WAGNER SINGLE-PHASE ALTERNATING-CURRENT INDUCTION POWER MOTOR.

The Problem of Electrolysis.

At a meeting of the Brooklyn Engineers' Club, held recently, Mr. Wynkoop read a paper discussing the electrolytic destruction of water and gas-pipes as a municipal problem. Many instances were cited, and numerous specimens of injured pipes exhibited. It was stated that experiments made by Prof. Samuel Sheldon seem to show that certain kinds of cast-iron have the property of resisting electrolytic corrosion, and it was suggested that it is well worth the while of iron makers to work along these lines, and search for better materials for pipe.

If any solution of the difficulties presented by electrolytic action is to be found, other than the suppression of the single overhead trolley system, it must come from a commission of technical experts representing the various interests affected. Such a commission might reasonably be hoped to settle the question once for all.

Electric Fixture Combination.

The long-talked-of combination or trust of all the gas and electric fixture manufacturers in the United States has now the appearance of a successful effort. Options have been given on all the larger concerns throughout the country. Several meetings of the manufacturers and the parties who are to finance the company have recently been held, at which the details and plans were decided upon. It is to be called the American Lighting Fixture Company, with $6,000,000 seven per cent preferred stock and $12,000,000 common stock.

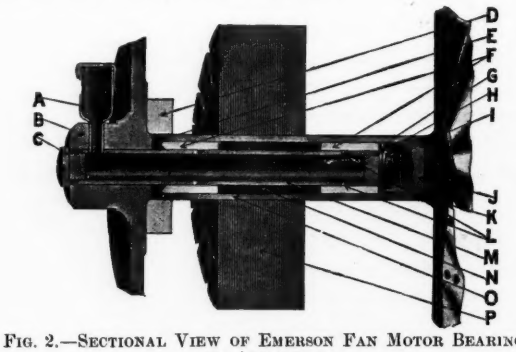


FIG. 2.—SECTIONAL VIEW OF EMERSON FAN MOTOR BEARING AND ARMATURE.

Telephone Service in Canada.

United States Consul-General John L. Bittinger writes from Montreal, as follows:

The Bell Telephone Company, Limited, covers the provinces of Ontario, Quebec and Manitoba, in the Dominion of Canada. The cost for telephone service in the city of Montreal is $30 for private residences and $50 for business houses per year. There is no cost for installation and rent. The cost at pay stations in the city is 10 cents for five minutes.

The telephone is first located by the company where the subscriber directs; if afterwards the instrument is required to be moved, such removal is done by the company at the expense of the subscriber.

The Bell Telephone Company has a long-distance service in the provinces of Ontario and Quebec, covering hundreds of stations. Their charges for this service for written messages of 20 words or under are as follows:

	Cents.
Up to 15 miles.....	15
15 to 150 miles.....	25
150 to 225 miles.....	50

Charge for delivery is extra. For each additional 20 words, or fraction thereof, one-half the above tariff is asked.

The province of Nova Scotia is covered by the Nova Scotia Telephone Company; New Brunswick, by the New Brunswick Telephone Company; Prince Edward Island, by the Prince Edward Island Company; Newfoundland, by the Anglo-American Telegraph Company. The city of Vancouver, B. C., is covered by the New Westminster & Burrard Inlet Telephone Company. Victoria is covered by the Victoria & Esquimalt Telephone Company.

Isolated Plant for the Capitol Building at Albany, N. Y.

The New York State Senate, on March 30, passed Senator Higgins's bill appropriating $60,000 to establish an electric lighting plant in the Capitol building, for the purpose of lighting the state buildings in Albany.

The Emerson Electric Manufacturing Company's Alternating-Current Fan Motors.

In the illustrations herewith are shown several types of desk and ceiling fan motors for alternating currents, made by the Emerson Electric Manufacturing Company, of St. Louis. The improved fan blades with which these motors are equipped have been designed so as to obviate the objectionable noise which has usually characterized the small high-speed electric fan motor. Numerous other improvements in mechanical construction have been made in the latest Emerson fans, and the makers believe that they have designed a motor free from many objections raised against rotary fans in the past.

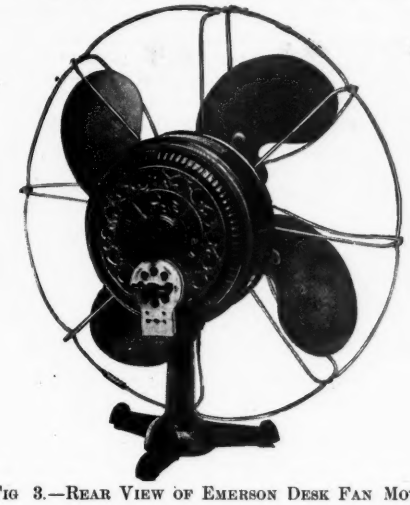


FIG 3.—REAR VIEW OF EMERSON DESK FAN MOTOR.

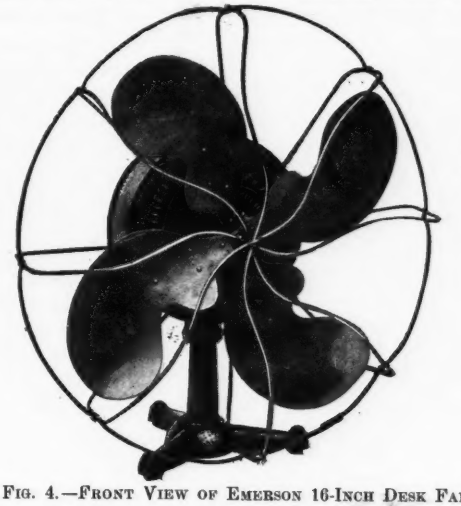


FIG. 4.—FRONT VIEW OF EMERSON 16-INCH DESK FAN.

In Fig. 1 is shown the motor with the armature removed. The shaft is of one-half-inch hardened steel, is of tubular form, and is rigidly fastened to the back cover of the motor. The illustration also shows the tubular armature hub into which the fan hub screws. Fig. 2 is a sectional cut of the motor bearing and armature. The reference letters indicate the following parts:

A, oil well; B, cast-iron hub (part of back cover); C, plug screw, right-hand thread; D, felt washer for oil; E, rawhide washer; F, bearing plugs; G, fiber retaining washer; H, brass retaining washer; I, retaining plug screw, right-hand thread; J, cast-iron fan hub, left-hand thread; K, leather sealing washer; L, oil holes; M, hollow steel shaft; N, cavity for lubricant; O, steel armature hub; P, armature.

There is considerable space between the bearing-plugs on which the armature rests at each end, and this space is filled with a lubricating compound sufficient to last an entire season under ordinary circumstances. The motor may also be oiled by putting oil into the cup which feeds both the bearings through the center of the hollow stationary shaft M, which is provided with suitable holes to allow the oil to reach the bearings. The rear end of the stationary shaft is absolutely closed by the brass plug-screw C and, therefore, the oil can not escape from the rear. As the fan hub J screws into the armature hub O and is furnished with a washer, no oil can escape from the front bearing, and, therefore, can not reach the fan blades and be scattered promiscuously. The design of the working parts of the motor is such that under no circumstances can oil be scattered by the motor.

In Fig. 3 is shown a back view of the Emerson desk fan motor for 16,000 alternations. The current consumption of this motor is said to be 125 watts at starting, and 110 watts while running at a speed of 1,700 revolutions per minute. The extreme height of the motor is 19 inches and the weight complete is 29 pounds. It is finished in black Japan and gold, with a polished brass fan. In Fig. 4 is shown a front view of the Emerson 16-inch desk fan for 7,200 alternations. The motor consumes 125 watts at starting and 110 watts while running at 1,600 revolutions per minute. The extreme height of the fan is 23 inches and the weight 31 pounds. Fig. 5 is a sectional view of the Emerson improved alternating-current ceiling fan. The reference letters designate the following parts:

A, hook eye; B, set screws to fasten sliding extension; C, pipe connector; D, set screw to fasten hanger; E, wires from line to binding-posts; F, wires from binding-posts to switch; G, steel shaft; H, armature; I, oil reservoir; J, lead washer; K, height of oil in reservoir; L, upper hardened steel bearing; M, steel balls; N, lower hardened steel bearing; O, switch.

The general construction of the motor which operates this fan is merely a "wheel within a wheel," the outside wheel, the field, being stationary, while the inside wheel, the armature, revolves on a large solid shaft on a ball-bearing immersed in oil. There is no moving wire, no commutator, no brushes, no reduction gear of any kind, no friction wheels and no wearing parts whatever, except one large solid bearing, and this revolves at only 150 to 210 revolutions per minute.

The great advantages claimed by the manufacturers for this fan are simplicity and excellent construction. The bearing, as shown in Fig. 5, is merely a long upright shaft with an oil cup screwed on the bottom, and on this shaft the armature revolves, resting on hardened steel balls which run on hardened steel ways and are immersed in oil. On this motor there is only one bearing to oil and only one place to oil it. The oil cup "I" should be filled up to the point "K" at the beginning of the season. This should supply sufficient oil to last the entire season.

The fan blades are large and have a wide sweep, and revolve at about 210 revolutions at full speed. The blades are carefully adjusted to give a maximum breeze. The current consumption is low, and the fan may be run at two speeds—210 revolutions on 125 watts, and 150 revolutions on 100 watts. The Emerson ceiling fan, for 7,200 alternations per minute, for any voltage, is shown complete in Fig. 6.

The Emerson Electric Manufacturing Company is a pioneer in alternating-current motor design and construction, and makes it an invariable practice to thoroughly test and inspect each motor before shipment.

FIG. 6.—EMERSON CEILING FAN COMPLETE.

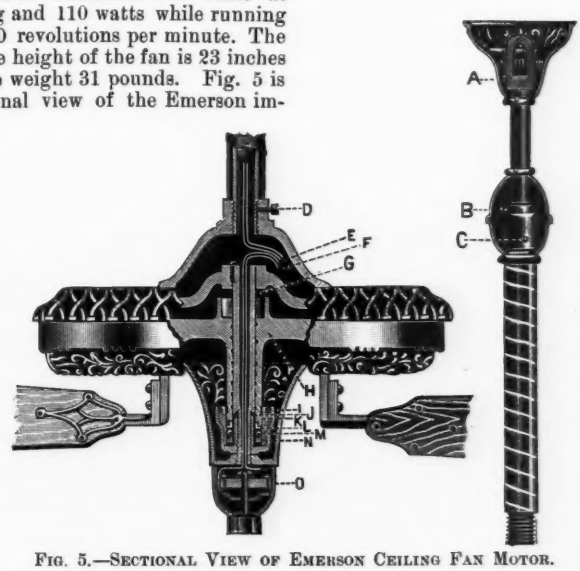


FIG. 5.—SECTIONAL VIEW OF EMERSON CEILING FAN MOTOR.

THE "INDEPENDENT" TELEPHONE COMBINATION.

INTERVIEWS WITH THE GENTLEMEN INTERESTED IN EFFECTING THE ORGANIZATION.

The ELECTRICAL REVIEW during the past weeks has carefully chronicled the developments of the movement toward merging the interests of the independent telephone manufacturers throughout the country with the greatest accuracy and completeness.

A representative of the ELECTRICAL REVIEW called on Mr. Wm. T. Blaine, who is, perhaps, the most active of any individual in the formation. The representative was received in the library of the Waldorf-Astoria, in New York, by Mr. Blaine and his associate in the promotion, Mr. Sterling L. Bailey, who, with Dyrenforth & Dyrenforth, patent attorneys, of Washington, Chicago and New York, are known as the active factors in the transactions.

Mr. Blaine is a man of striking personality, with forceful and effective methods. He is president of a successful telephone manufacturing company, and shows the peculiar directness and ability for getting at the heart of things that come from newspaper training, having been identified in the management of a large Chicago daily.

"What is the status of the telephone combination to-day?" asked the representative.

"Permit me to correct the word 'combination,'" replied Mr. Blaine. "This movement means neither a trust, combination nor monopoly for the manufacturing of telephone apparatus for the independent field. The plan merely means that these telephone companies will be bought by an aggregation of capital and merged into one company. With your familiarity with the telephone developments of recent years, you must know that, as a business proposition and so far as the welfare of the independent exchanges is concerned, such a movement is necessary."

"How necessary, Mr. Blaine?"

"It will be advantageous because the new company will standardize telephone apparatus; it will own all patents and employ the best experts now operating individually and competitively, under one management, and focus the advantages of all this in one type of telephone apparatus. We want it stated emphatically that this change has been made possible because the underlying principle is that the 'independent' people—the consumers—will be benefited by the change."

"We would like you to tell us the financial institutions interested," remarked the representative.

Mr. Blaine replied: "We shall make a full statement as to these names, the companies in our control, the location of our manufacturing centers, the policy of our operations, the personnel of the officers of the company and the board of directors, and all those things which will interest you. You will excuse my not mentioning the names to day, as it is not in accordance with our plans. The ELECTRICAL REVIEW will have all this as it develops at the earliest possible moment, and we will enable you to publish the facts as they become authentic without delay. I may add, in justice to you, and for the benefit of your readers, that the names of the manufacturers which have been published as having been bought and now under our control is false, erroneous, and has never been issued by any one in authority. In fact, I may say that no one in a position to know has given the information, and the list is guess-work. The list which has been circulated includes some which we have not been able as yet to include, and some have been omitted which we have in our control."

"Enemies of the movement have made the statement that the financial element in the movement is not assured," remarked the representative.

Mr. Blaine, in response to this, emphatically assured the representative that the money had been raised, that the purchase of these companies was an assured fact, and that the ELECTRICAL REVIEW might say with absolute definiteness that 20 of the companies were now committed and bound, and that these 20 companies represented more than 90 per cent of the manufacturing now done in the "independent" telephone field.

Mr. Bailey remarked that the policy of the company as outlined by those responsible in the movement was being carried through on the basis that the attitude of the new company should be absolutely just to the independent exchanges, that reasonable prices should rule, and the organization be conducted on the broadest and most generous lines, adding, "It will be satisfied with the usual relations that exist between patrons and their sources of supply," meaning that exhorbitant prices would not be demanded. Mr. Bailey said further: "We think that the field should be congratulated on this development, because it will mean one standard of construction and one standard of apparatus, which will bring a standard of service. It is intended to give careful consideration to the connection by toll lines of independent exchanges."

It was suggested that sales offices would be maintained in all the large cities, and that three manufacturing centers would furnish the product. It has not been decided, but Chicago, Cleveland and New York are under consideration for these factories.

THE VIEWS OF A NUMBER OF THE LEADING TELEPHONE MANUFACTURERS ON THE QUESTION OF CONSOLIDATION.

A representative of the ELECTRICAL REVIEW visited a number of the houses devoted to the manufacture of telephone apparatus and received the opinions presented in brief below:

FARR.

We have been asked our opinion of the consolidation that has been talked of by the principal independent telephone companies of the United States. Would think it would be beneficial to several of the largest companies now doing business in the United States. However, we do not think it would be to our interest to join such a consolidation, as we can not possibly see how we could be benefited, as our business has cost us many thousand dollars in advertising. We could not expect that we would be represented in such a consolidation satisfactorily to ourselves.

Farr Telephone and Construction Supply Company,
C. W. FARR, President.
Chicago, March 11.

NATIONAL AUTOMATIC.

In regard to the amalgamation of manufacturers of independent telephone apparatus, I wish to say that I do not consider that we would be included among the general manufacturers of to-day, as we own and control a distinct and separate field, and our prices would not compete with the prices of others. Consequently, we are not in favor of any amalgamation of interests or can not see how it would benefit our company.

The National Automatic Telephone Company,
F. A. LUNDQUIST, Supt.
Chicago, April 1.

WILLIAMS.

The Williams Electric Company, after stating it was consistently opposed to all trusts and combinations, said:

We believe that independent telephony is just in its infancy and that it can best be fostered by open competition. It has been argued by some manufacturers that competition has cut prices all to pieces and that their business is not as lucrative as it might be. We wish to say that we are perfectly well satisfied with the prices we are obtaining for our apparatus and perfectly well satisfied with the volume of business we are getting. The telephone manufacturing business, just as any other manufacturing business when it is going through a stage of development of weeding out poor apparatus and unskillful manufacturers, will be governed by the law of the "survival of the fittest;" that is, the manufacturers who uniformly make the best goods and sell them at the most reasonable prices will be the manufacturers who will be doing business on a profitable basis long after many others have come and gone and are forgotten.

The Williams Electric Company,
J. A. WILLIAMS, Pres. and Gen. Mgr.
Cleveland, April 1.

WHITMAN & COUCH.

In reply to your telegram of yesterday, would state that we see no advantage in joining any combination of independent telephone manufacturers. We prefer to conduct our own business in our own way, and have no reason for delegating its management to any one else. We started as independent manufacturers, and shall continue to do business on the same basis as in the past.

Whitman & Couch,
E. B. SEELEY.
Boston, April 1.

EUREKA.

There is no question of doubt that the amalgamation of the independent telephone industries of this country means a good deal for both the manufacturers and independent telephone exchanges. The standardization of apparatus is a point that should be considered, because it will place the independent exchange in the same position that the Bell and Central Union now are. While we do not hesitate in saying that we think they will do a very large business, we feel as being one of the few outside of it we shall get our share of business, as we are now manufacturing apparatus that is absolutely standard and are not afraid of competition.

Eureka Electric Company,
A. STEIN, Secretary.
Chicago, April 1.

WESTERN TELEPHONE CONSTRUCTION.

President J. E. Keelyn, of this company, said: "Yes, there is talk of a consolidation of telephone manufacturers. From all appearances it promises to be successful. Personally, I have never shown a great favor for trusts or monopolies, and such a consolidation would probably not involve a monopoly. I expect to continue in the telephone business and carry out more fully my past record. This precludes the suggestion that the Bell company would, eventually, control me or my company.

"Two or three strong manufacturing concerns in the independent telephone business would be better than 50. There is plenty of room

for every man who understands the telephone business to take up some special work or occupy some particular field now unoccupied. The assembling of telephones is now as much of a relic as the assembling of bicycles. We are, at present, increasing our manufacturing capacity and proposed contract arrangements for the next year's business. We are working night and day; our business is profitable and prosperous; we can be depended upon to befriend our friends in either phase of this consolidation subject."

STROMBERG–CARLSON.

We have a full line of telephone apparatus of the most modern type for any size plant, and see no good cause for combining with other manufacturers. While the future of independent telephony, to a great extent, depends on the manufacturers, we believe, however, that the standardizing of apparatus and systems should be left to the good judgment of exchange builders, and not in the hands of a manufacturing combination.

We propose to remain strictly independent.

The Stromberg–Carlson Telephone Manufacturing Company,
HENRY SHAFER.

Chicago, April 1.

AMERICAN ELECTRIC.

When Mr. P. C. Burns, of the American Electric Telephone Company, Chicago, was asked his views as to the proposed combination, he politely declined to discuss the matter, saying: "I do not wish to speak of the matter for publication."

Traffic Arrangement Between the Third Avenue and Elevated Railroads in New York.

A traffic agreement between the Manhattan Railway Company and the Third Avenue Railroad Company, of New York city, was effected on April 3, by which a complete series of passenger transfers between the elevated railway system and the surface railroad systems of the two companies named will go into effect on May 1, or sooner.

The agreement also includes in the future the joint use of power stations which will furnish the electric current by which the cars and trains of the two companies will be operated. It is expected that the resulting economies will be large, and it is possible that the surplus current from the combined power houses may be distributed to the general public for light, heat and power through the conduits of the Third Avenue Railroad Company and the elevated structures of the Manhattan Railway Company.

The arrangement provides rapid transit facilities from Yonkers on the north and New Rochelle on the northeast to the Battery at the extreme southern end of Manhattan Island. Numerous transfer stations to cross-town lines will be established, and the maximum of fare and transfer will be eight cents, which will include passage on express trains.

A New Incandescent Lamp Reflector.

For increasing and properly diffusing the light from incandescent lamps, Schiff, Jordan & Company, 232 Greenwich street, New York city, are importing from Germany a combination reflector which is known as the "S. J." reflector shade.

As shown in Fig. 1, the outer reflector is made of high-grade mirror glass and the inner one of porcelain.

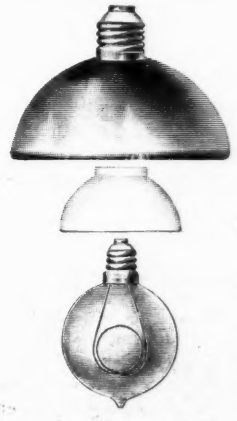


FIG. 1.—"S. J." REFLECTOR SHADE, SHOWING MIRROR AND PORCELAIN REFLECTORS.

The inner porcelain reflector is designed to dissolve the glare and shed a soft and diffused light from the mirror. The outer has a screw-base which is applied directly to the socket, obviating the need of a shade-holder. The base may be used with any socket and any lamp, as well as for the 16-candle for which it is primarily designed.

Two presentations were recently made to Mr. C. L. Oechsner, on the occasion of his leaving the General Electric Company for a better position with the British Thomson–Houston company in London. The first of these consisted of a fine gold chain and traveling case by Mr. J. G. Barry, on behalf of Mr. Oechsner's colleagues in the Schenectady Works. The second was made by the Grand High Priest of the St. George Chapter Schenectady Royal Arch Masons, in which body Mr. Oechsner has been a High Priest. This consisted of a beautiful ruby and diamond Knight Templar's jewel. Mr. Oechsner joined the Thomson–Houston company 11 years ago, and was for some years assistant to the late Charles J. Van Depoele. After the Thomson–Houston company was absorbed in the General Electric Company, he became drafting inspector in the engineering department of the latter company, and has since filled that position. He has many friends in Schenectady, both in and out of the works, who wish him luck in his promotion.

The New York Electrical Exhibition.

Everything is going along swimmingly in regard to the arrangements for the Third Electrical and Kindred Industries Exhibition, which will be held under the auspices of and in connection with the twenty-second convention of the National Electric Light Association at Madison Square Garden, New York city, from May 8 to June 3. The following is a partial list of exhibitors who had engaged space up to March 15:

American Engine Co., Bound Brook, N. J.
American Electric Novelty and Manufacturing Co., 255 Centre street, New York.
American Vitrified Conduit Co., 39 Cortlandt street, New York.
American Electric Vehicle Co., 1,545 Michigan avenue, Chicago.
American Miniature and Decorative Lamp Co., 255 Centre street, New York.
American Circular Loom Co., Boston, Mass.
Adams–Bagnall Electric Co., Cleveland, Ohio.
American Mutoscope Co., 837 Broadway, New York.
American Pulley Co., Philadelphia, Pa.
Ball & Wood Co., 120 Liberty street, New York.
Buffalo Forge Co., Buffalo, N. Y.
Boston Electro-Duct Co., Boston, Mass.
Bullock Electric Co., 220 Broadway, New York.
Bossert Electric Construction Co., Utica, N. Y.
Bryan Marsh Co., 136 Liberty street, New York.

FIG. 2.—"S. J." INCANDESCENT LAMP REFLECTOR SHADE.

Cling Surface Manufacturing Co., 146 Virginia street, Buffalo.
Cincinnati Shaper Co., Cincinnati, Ohio.
Crocker-Wheeler Electric Co., 39 Cortlandt street, New York.
Camp Co., H. B., Aultman, Ohio.
Colliery Engineer Co., Scranton, Pa.
Corey, R. B., 26 Cortlandt street, New York.
Columbia Incandescent Lamp Co., St Louis, Mo.
Cutter Electrical and Manufacturing Co., 1112 Sansom street, Philadelphia, Pa.
Dietz, Schumaker & Boye, Cincinnati, Ohio.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Dale Co., The, Thames and Greenwich streets, New York.
Emerson Electric Manufacturing Co., St. Louis, Mo.
Estey & Saxe, 97 Fifth avenue, New York.
Electrical Appliance Co., Jersey City, N. J.
Electrical Engineer Institute of Correspondence Instruction, 120 Liberty street, New York.
Forbes, W. D., & Co., Hoboken, N. J.
Fayerweather & Ladew, 159 East Houston street, New York.
Frink, I. P., 551 Pearl street, New York.
Granger, Francis, 26 Cortlandt street, New York.
Griffing, A. A., Iron Co., 66 Centre street, New York.
Gold Car Heating Co., Frankfort and Cliff streets, New York.
General Incandescent Arc Light Co., Thirty-third street and First avenue, New York.
International Correspondence Schools, 14 East Seventeenth street, New York.
Indiana Bicycle Co., Indianapolis, Ind.
India Rubber and Gutta-Percha Insulation Co., Glenwood, N. Y.
Kaufman & Alexander, 1153 Broadway, New York.
Lamble, H. V., Rockaway, L. I.
Libbey Glass Co., Toledo, Ohio.
Machado & Roller, 203 Broadway, New York.
McCay Engineering Co., 106 East German street, Baltimore.
National Gramophone Co., 874 Broadway, New York.
National Meter Co., 118 Chambers street, New York.
New York Electric Equipment Co., Thirty-third street and First avenue, New York.
Northern Engineering Co., 39 Cortlandt street, New York.
Niles Tool Works, Niles, Ohio.
Northern Electrical Co., Madison, Wis.
New York Telephone Co., 18 Cortlandt street, New York.
Orient Electrical Co., Youngstown, Ohio.
Prindle Pump Co., 120 Liberty street, New York.
Paragon Fan Motor Co., Brooklyn, N. Y.
Pope Manufacturing Co., Motor Carriage Department, Hartford, Ct.
Pittsburgh Reduction Co., Pittsburgh, Pa.
Rockwood Manufacturing Co., Indianapolis, Ind.
Roebling, John A., Sons Co., 117 Liberty street, New York.
Risley–Bird Manufacturing Co., 94 Fifth avenue, New York.
Riker Electric Motor Co., 45 York street, Brooklyn, N. Y.
Standard Steam Specialty Co., 83 Centre street, New York.
Stirling Co., The, Chicago, Ill.
Safety Insulated Wire and Cable Co., 229 West 28th street, New York.
Warren–Medbury Co., Sandy Hill, N. Y.
Williams, J. P., 39 Cortlandt street, New York.
White, S. S., Dental Manufacturing Co., Chestnut and Twelfth streets, Philadelphia, Pa.
Wagner Electric Manufacturing Co., St. Louis, Mo.
Willard & Frick, Rochester, N. Y.

Advertising Pointers.

Be patient.

Don't expect a mad rush on the part of the public the moment you spring your first advertisement upon them. If you want a good crop you must sow good seed and plenty of it. One grain of corn won't produce it.

You've got to impress your readers often and well. It's the constant repetition that does the work.

Many an advertiser says "it doesn't pay" because one measly little ad. didn't block up his store with customers.—*Printers' Ink.*

In the April number of the *North American Review* the Hon. Robert P. Porter calls attention to "The Future of Cuba," and points out some of the enterprises of modern endeavor likely to be undertaken upon that island by American and English capitalists.

CHICAGO ELECTRICAL TRADE NEWS.

The Cutler-Hammer Manufacturing Company, of Chicago, have recently opened up a New York office at 136 Liberty street, and have appointed Mr. W. H. McGregor their agent to look after the eastern business. A large stock of rheostats will be carried there to supply the company's eastern customers.

The Dearborn Electric Company, of Chicago, are western agents for the "Bates ceiling fans," and are contemplating selling a great number this season. The "Bates" fans have been on the market for a number of years and are guaranteed to be among the best fans made for both direct and alternating current. The Dearborn Electric Company are also having a splendid sale on their Dearborn telephones.

The Allen Hussey Company, of 211 and 213 Randolph street, Chicago, manufacturing exclusively interior telephone systems, have recently opened a New York office and factory at 101 Beekman street. The intercommunicating telephone systems manufactured by this company are in daily use in many of the largest cities in the country, and they claim to have over 400 systems in most successful operation in Chicago alone.

The W. R. Garton Company, manufacturers' agents, have moved into handsome new quarters in the Manhattan Building, suite 603 and 604. This company, of which W. R. Garton is president and treasurer and Ray P. Lee secretary, was organized in May, 1898. The W. R. Garton Company succeeded W. R. Garton, of Chicago. They carry a complete stock of railway material, insulating compounds, tapes, wires and cables, etc.

The Miller–Knoblock Company, of South Bend, Ind., have long been known throughout the country for the manufacture of street railway sprinkling cars. An electrical department, for the manufacture of commutators for all standard street railway motors, is also a large part of this institution. In this shop armatures are also rewound by expert workmen. The electrical department is directly under the able management of Mr. A. W. Morrell, who has had years of experience in street railway and lighting matters. All standard types of commutators are carried in stock by this company.

The Chicago Fuse Wire and Manufacturing Company announce a steady and increasing demand for their trade-mark line of tested fuse wire and links; and that their new method of packing in tin boxes has become very popular alike with the dealer and consumer, as it keeps the wire practically air-tight and insures against any possible danger in handling the stock. Conforming to the National Underwriters' rules, this Company are placing their trade-mark on each fuse-link terminal, and they state that in this branch of their business they have also made great improvements, which not only enhance the appearance and accuracy of the goods, but by a special improved process they are able to reduce the cost of making, and thus offset the recent advanced cost of material. F. E. C.

Chicago, March 31.

Exhaust Steam Mains in Cities.

Quite a number of cities and towns are mentioned by the officers of the American District Steam Company, of Lockport, N. Y., as putting in new steam mains for the use of exhaust steam in connection with electric light and power plants. It is also suggested that the better condition of the industrial world and the unloosening of capital may be a contributing factor in inducing so many of these companies to place large equipments at this time. Among others which may be mentioned, the plant which will be installed by the Wilkinsburg Electric Company, of Pittsburgh, is of interest. This installation will be put through the streets in the "East End" of Pittsburgh to the extent of 11 miles of underground mains. This is all for use in heating residences through this aristocratic portion of the city.

The Danville Gas, Electric Light and Street Railway Company at Danville, Ill., are about to place a large extension to their equipment; this present equipment is already heating 5,000,000 cubic feet of space, and the results have been so satisfactory that the people of the city have requested the local company to broaden the facilities, and as a result this increase is being constructed. The city of Quincy, Ill., last Spring put in a first installation of this character, and this Spring is installing two miles more of mains in the streets.

The work mentioned is but a slight portion of all that this company, which manufactures the mains used under the "Holly" and other patents, have now in view; one of the large eastern cities has practically perfected arrangements for the system, and a great deal of the same character of work is likely to be placed in the far western cities.

J. H. Bunnell & Company Secure an Injunction on Primary Batteries.

At a special term of the Supreme Court, Part II, held in and for the city and county of New York, at the County Court House, on March 30, 1899, Justice Francis M. Scott granted a permanent injunction in the case of J. H. Bunnell & Company against the Manhattan Electrical Supply Company, restraining the latter from manufacturing or selling medical batteries similar in appearance or design to the well known No. 4 D.D. "Home Medical Battery," a cut of which is shown herewith. An accounting for damages was ordered, and on March 31 judgment therefor was entered against the Manhattan company.

Messrs. Bunnell & Company originated this battery several years ago,

BUNNELL'S MEDICAL BATTERY.

and as it was an entirely new departure, in form and otherwise, from anything hitherto produced, its introduction to the trade and medical fraternity, as well as to the public, was very expensive. Messrs. Bunnell & Company having faith in the merits of this battery persisted, and in time were beginning to reap their reward, when various concerns, seeing the demand that had been created, commenced making and selling imitations of the battery. Finally it was determined to commence suit against all infringers, beginning with the Manhattan company, which was considered the most responsible of the aggressors.

The decision just rendered in favor of J. H. Bunnell & Company means a vigorous prosecution of all offenders, and Messrs. Dickerson & Brown, attorneys for Bunnell & Company, have been instructed to immediately proceed against several other manufacturers and dealers who are handling imitations of their battery.

The Manhattan company has applied for and received a license from Bunnell & Company giving them the right to make and sell the battery in question under royalty.

BUSINESS NOTES.

J. Ferro, 45 Broadway, New York, offers imported carbons (in bond) for direct and alternating-current long-burning arc lamps.

Messrs. Goldmark & Wallace, 123 Worth street, New York, have accepted the selling agency for Trotter's "Mona" commutator compound.

The Cutler-Hammer Manufacturing Company, 70 to 82 West Jackson street, Chicago, manufacturers of the well known "C-H" rheostats, have increased their capital from $50,000 to $100,000. This was made necessary by the recent tremendous increase in the company's business.

The Bossert Electric Construction Company, Utica, N. Y., are having an unusually large Spring demand for the standard "Bossert" specialties, which include steel outlet and junction boxes, switches, panel-boards and switches. The company are now designing some new adaptations in switches.

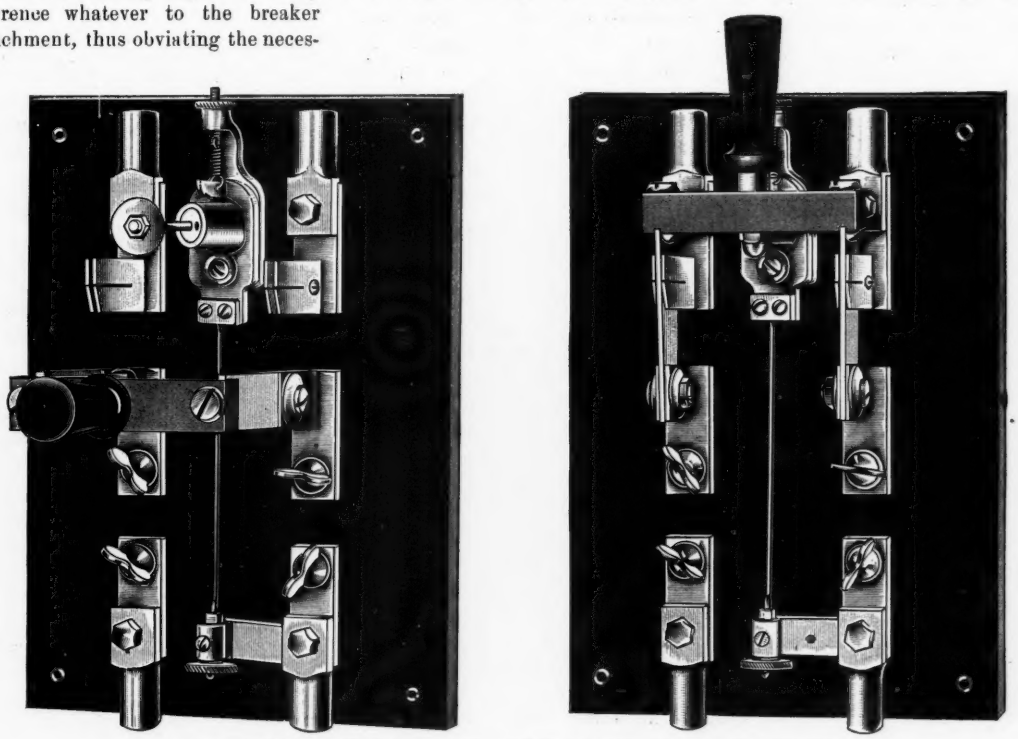
The "Locke" insulators are now being made at Victor, New York, and not manufactured under contract by other companies as heretofore. Mr. F. M. Locke has completed the construction of a new plant with every facility for working and moulding clay, and has a large complement of skilled men at his command. The factory has a complete power-plant and is located directly on the railroad with every shipping convenience. The new catalogue of high-voltage and other insulators will interest every electrician.

A Barometer for Weather Conditions—The diversities of electrical applications are many. To handle all lines of electrical supplies satisfactorily frequently requires additions of what may be termed physical apparatus, and without doubt there are many instruments under this heading that could be used to great advantage by the station manager. The Central Electric Company, Chicago, has just issued a little booklet entitled "A Barometer for Weather Conditions," and the line of apparatus shown therein can not fail to interest those who are concerned in weather matters and desire to operate electric light and railway plants at minimum risk.

Messrs. Machado & Roller, 203 Broadway, New York, represent in New York city and locality the following manufacturing companies: F. Hardmuth & Company, Limited, Whitney Electrical Instrument Company, Ohio Storage Battery Company, W. S. Hill Electric Company, Ohio Electric Specialty Company. The exclusive representation given this company by this list of well known firms enables them to offer quotations on all types of slow and medium-speed dynamos and motors and direct-connected apparatus, switches, rheostats and switch-board fittings, electrical instruments, dynamo and woven gauze, arc-light carbons, cored and solid; storage batteries, and the "A. E. G." incandescent lamps.

A New Expansion Circuit-Breaker.

In the illustrations herewith is shown the "Buffalo" expansion circuit-breaker which is being placed upon the market by Messrs. McCarthy Brothers & Ford, 45 North Division street, Buffalo, N. Y. The breaker consists of an attachment placed on the ordinary knife-switch, the complete instrument performing the functions of both knife-switch and circuit-breaker. The switch may be used in the ordinary way without any reference whatever to the breaker attachment, thus obviating the necessity of a switch separate from the circuit-breaker.



EXPANSION CIRCUIT-BREAKER WITH SWITCH IN OPEN AND CLOSED POSITIONS.

This breaker depends for its operation on the expansion of a metal rod, due to the heating effect of the current flowing through it. When the thermal rod expands under the heating effect of the current it actuates a tripping device, which holds the opening spring in a closed position, thus releasing the spring and throwing the switch. It is stated that the rod will open the switch before heating to such an extent as to be unbearable to the hand.

It is claimed that this breaker is in every respect as serviceable as magnetic circuit-breakers, and that it is superior to them for some classes of work, especially for motors. In such applications the time element may be made as large or small as desired. The expansion-breaker takes care of the first rush of current, or a continuous flowing current will open the circuit in five or ten seconds, or in one minute, according to the adjustment of the instrument. The switch is opened by means of an extremely strong spring operating in the center of the connecting bar. This spring is held in a compressed position by a catch, the normal position of which is open, but which is held closed by the expansion rod. Any excess of current through the rod above its rated capacity will cause the wire to heat, which, in heating, will expand, allowing the catch to open, thus releasing the spring which throws the switch-handle. It is stated that the wire will expand on less than 10 per cent increase of current over the rated load, enough to allow the spring to act, and on a short-circuit will operate instantaneously. The rod is made of special metal, whose resistance is about the same as a fuse of the same carrying capacity one inch long. The instrument can be used on either direct or alternating current of any voltage, and, as may be seen by a glance at the illustration, is extremely simple in construction. These expansion circuit-breakers are furnished with fuse terminals as an extra precaution against accidental disablement of the breaker attachment. If anything should happen to the latter a set of ordinary fuses can be inserted in the circuit until necessary repairs are effected.

These breakers are made single, double or triple pole, single or double throw, with switches either single or double break. They are also provided with front or back connections, with or without carbon breaks, and are made in sizes ranging from 25 to 200 amperes capacity.

A Boston View of Wall Street Expansion.

[*From the Boston News Bureau.*]

What the politicians, the boards of trade, the Stock Exchange committees, the leading financiers and the prominent stock operators could not do, modest Admiral Dewey did when he presented to the American people—and with no words about it—a May-day Manila victory that awoke the whole world to the possibilities of American eight-inch guns—with the men behind the guns.

The echo of Dewey's guns in Manila Bay did not reach the ears of millions of savages in the Philippines armed with bows and arrows, but they sounded the end of an empire that had not only discovered America, but had once ruled the seas; awoke three hundred millions of Europeans and a hundred other millions dividing the waters of the North Atlantic and the North Pacific and thousands of millions of American dollars; for nowhere did the echo of Dewey's guns sound so long and with such increasing force as in Wall street. For more than 10 months now that echo has been rolling around lower Broadway, Wall street, Broad street and Nassau street, encircling their giant 20-story structures, and it has been building, rebuilding and building again, financial and industrial creations not only of millions but of tens of millions and hundreds of millions, until it seems within the range of possibilities that the standard of future large American corporations may be one thousand millions.

Electrolytic and Lake Copper.

[*From the Engineering and Mining Journal.*]

We have called attention several times to the recent great difference between the prices of Lake and electrolytic copper, which has been as much as one cent a pound, and to-day may be quoted as five-eighths to seven-eighths cent per pound, while a normal difference should not exceed one-fourth cent. This difference is due chiefly to the fact that the production of Lake copper is limited, being less than one-third of the entire production of this country, and more than half of this output is made by a single producer. All the producers are sold ahead, so that it is impossible to secure the metal for prompt delivery, and were it not for the high character of the managers of the great Lake mine, this brand could be easily manipulated. It is, in fact, now a speculative brand, and therefore its price is not so safe a basis for contracts as is that of the more stable electrolytic copper, which is made from the product of the mines of the whole world. The uses of electrolytic copper are constantly extending, and for some purposes it is even preferred to Lake. It is only the temporary scarcity of the latter that accounts for the difference in price of to-day.

OBITUARY.

A cable dispatch from Berlin, Germany, states that Gustav Wiedemann, professor of physics and chemistry in the University of Leipsic, is dead. Professor Wiedemann was born at Berlin October 2, 1826. He was known for his researches concerning electricity and magnetism, and was editor of *Wiedemann's Annalen.*

Charles J. McAleese, aged 49 years, who for almost 20 years was superintendent of the police and fire-alarm telegraph system of Baltimore, Md., died at his home in that city on March 18 after being seriously ill for a few days. Mr. McAleese succeeded J. Frank Morrison as superintendent of the fire-alarm and police telegraph system when the latter was appointed a member of the Board of Fire Commissioners in 1878.

FOREIGN ELECTRICAL NEWS.

Electricity in Pekin—The capital of the Chinese empire is shortly to be lit by electricity. Messrs. Siemens & Halske, of Berlin, one of the most important electrical houses in Europe, have lately secured the contract from the government to erect the necessary central station, and work, it is said, will be commenced at once. A few months ago this firm was fortunate enough to secure the construction of an electric tramway in the same city.

An International Congress of Physicists—At a meeting of the committee of the Société Française de Physique, in December last, it was decided to hold an international congress of physicists in 1900. The congress will be held in the buildings specially set apart for this purpose at the French universal exposition to be held in Paris next year, the date fixed for the re-union being July 16 to 21. The committee also decided that the society would not take part as exhibitors at the exhibition.

"Electricity in the Home"—Under this title the Belgian Society of Electricians have organized an exhibition, to be opened on June 1 in the new telephone building in Brussels, which the Belgian Government has kindly placed at the disposal of the society. The exhibition, which will comprise the domestic application of electricity, is under the patronage of the royal house of Belgium, Prince Albert being honorary president of the committee. The town of Brussels has awarded a subsidy to the exhibition, which, although it is not an international affair, will open its doors to foreign exhibitors who are represented in Belgium by an agent.

Prizes to be Won—The Swiss Society of Chemical Industries has offered prizes in connection with the following problems: "A prize will be given to the author of a work useful to the development of electro-chemical industry in Switzerland. The subject of the study is left to the choice of the contestants. A sum of 2,000 francs is placed at the disposition of the jury who may either award it as a single prize or divide it among the best of the contestants. The second problem bears on the construction of a steam meter, the prize offered being 1,500 francs. Candidates are allowed until the 1st of May to enter their names for the contest, and the prizes are to be awarded a year from that date. Foreigners are permitted to try for both prizes, the language to be used being either French or German. Manuscripts must be sent in before May 1, 1900, and addressed to Mr. Schaeppi, president of the Society, Mitlödi, Canton of Glaris.

Speed Attained by Electric Carriages—The Count de Charselouh-Loubat, an ardent patron of the automobile, has until lately held the record unchallenged for road traveling in an electric carriage. His previous record has, however, been broken by M. Jenatzy, who wagered that he would eclipse the speed attained by the count. This he succeeded in doing, but in a subsequent race the count retrieved his laurels and thus remains the champion automobile driver of the day. The following table gives the speed obtained in the three races:

	Time 1st Kilometer	Time 2d Kilometer	Total Time
Charselouh-Loubat	1m. 12s.	57s.	2m. 9s.
Jenatzy	1m. 8s.	54s	2m. 2s.
Charselouh-Loubat	56⅘s.	51⅘s.	1m. 47⅗s.

The average speed for the 2d kilometer was thus 70.3 kilometers an hour, a speed equal to that of an express train. M. Jenatzy is preparing a new carriage, equipped with more powerful motors, with which he hopes to make speeds of 80, 90 and even 100 kilometers an hour.

The Source of Energy in Radio-Active Bodies—Madame Curie and her husband have recently shown that the new radio-active bodies discovered by them, polonium and radium, are capable of emitting energy without any apparent source. These bodies appear to derive their energy from some source not yet suspected, which constantly renews itself, and the supply of which is practically inexhaustible. This has induced a "note" to the French *Académie des Sciences*, in which the eminent physicist, Dr. V. W. Crookes, thus expresses his thoughts on the matter: "I have long endeavored to reconcile this problem of a production of energy, apparently illimitable, with the accepted rule of to-day. As we are reminded by Dr. Storey, the resources of molecular movements are far from being exhausted. There are numerous reserves of energy in nature which can be offered by bodies of a suitable constitution, without any manifest cause. Some time ago I drew attention to the enormous quantity of energy imprisoned in ether. Coming more within the bounds of our experiments, however, are the movements of atoms and molecules . . . and it is not impossible to conceive of the molecules of the surrounding air being separated one from the other; the molecules that are in rapid motion being separated from those that are less active. This separation of the rapidly moving molecules takes place in liquids whenever they are in a state of evaporation, and, in the case of the constituents of the atmosphere, wherever it contains constituents sufficiently light to escape into space, molecule by molecule. As far as I have studied, I conceive an instrument in the form of an ordinary piece of metal, colder than the surrounding air, acquiring an energy that raises its temperature by degrees until it is able to separate the molecules of the air around it. I have also conceived another instrument of such a construction as will enable it to reject the less rapidly moving molecules with a slight change of energy, but influenced in such a manner by the projectiles of more active motion that it appropriates a little of their energy. Let us admit that uranium and thorium, bodies possessing the densest atoms, polonium and radium, have a structure which permits the rejecting of atmospheric molecules possessed of less active motion, while molecules of more active energy, breaking on the surface, have their energy reduced and that of the separating instrument increased in a corresponding manner. The energy thus gained appears to be partially employed in separating some of the molecules of gas (or in producing some other condition which has the effect of rendering the surrounding air, to a certain degree, a conductor of electricity), and partially in producing an undulation through the ether, which, as it takes its birth in phenomena that have but little connection except as shocks of atmospheric molecules, must furnish a strong contingent of light undulations of little amplitude. The smallness in the case of these Becquerel rays appears to approach, without reaching, the extreme momentum of the ordinary Roentgen rays. The reduction in the rapidity of the rapidly moving molecules would cool the air-bed to which they belonged; but this cooling would be compensated for by the radiation of the conductivity of the surrounding atmosphere. Under ordinary conditions, the difference of temperature would be hardly appreciable, and the polonium and radium would thus seem to be perpetually emitting rays of energy without any apparent reconstitution. The total energy of the two movements of the imprisoned molecules in air at repose, at an ordinary pressure and temperature, is about 180,000 pounds to the foot in each cubic meter of air. Consequently air at rest in a chamber four meters in height by eight meters in width and seven meters long contains enough energy to work a machine of one horse-power (steam) during at least 15 hours.—*L'Electricité.*

General Electric Company Entertains Editors.

A party of a dozen editors of the electrical and engineering press, as guests of the officers of the General Electric Company, took the "Empire State" from New York, Friday morning, March 24, for a tour of the Schenectady shops and an inspection of the recent improvements in the equipments and facilities. The party were shown through the new machine shop, which is one of the largest and most perfectly constructed in the world, then were escorted to the foundry to watch the casting of a huge "spider," the pouring of which had been timed for the company's benefit. After a complete tour of the great plant the distinguished editors were taken over the experimental third-rail system, returning in time for dinner—luncheon having been served on arrival—and the fast train for New York, reaching the city the same day.

Electric Stocks.

The *Wall Street Journal*, in a recent issue, said:

Electric stocks are getting more in favor every day. General Electric, Electric Vehicle and Electric Storage are moving higher with increasing volume of speculation. Electric Vehicle is being bought on a steadily increasing volume of business. Last week an order was placed for 1,000 electric vehicles from one concern and is likely to be followed by other orders from the same source. This is the parent company, and its revenue from subcompanies is calculated to be likely to rival the profits of the Bell Telephone.

The Michigan Electric Railway Company, representing New York capital, which proposes to construct an electric line through Linden east, connecting Fenton, Long Lake, Holly, Clarkston, Pontiac, at the latter place connecting with the Pontiac & Detroit line, and west, connecting Argentine, Byron, Durand, Bancroft, Corunna, etc., has been granted a franchise by the Village Council.

True Meaning of the "Ellsworth Amendment" and Erroneous Statements Corrected.

The present status of legislative enactments necessitates electric companies in New York State and in some other states, that are incorporated under the "Transportation Act," to get their charters amended under another act before they can sell their by-product, exhaust steam. The passage of the "Ellsworth Amendment," now before the New York State Senate, would permit these local electric companies to legally sell this exhaust steam without following the red tape for acquiring the privilege in this indirect and technical manner.

A large manufacturing company, of unquestioned reputation in the industrial world, consulted every electric company in the state supplying light, heat or power, and as the result of the solicitation brought forth by this open canvass of a most representative number of these central stations, Senator T. E. Ellsworth, from the Niagara Falls district, consented to introduce an amendment to the existing bill. It is evident to one who understands the character of these electric central station properties and their relations to their local towns and cities, that the measure is without subterfuge, and is commendable from either the point of the station owners or the municipalities.

The New York *Herald* has published the statement that the bill is designed to favor the New York Electric Light, Heat and Power Company, "to add tremendously to the franchise now held by Mr. Whitney's company." This statement has been found by the ELECTRICAL REVIEW to be unjust to the Whitney syndicate and an unnecessary reflection on Senator Ellsworth's position.

The *Herald*, in the headlines of the same article, also states that the bill "permits the corporation to tear up all the streets." Had the *Herald* writer read carefully the text of the measure, he would have found the following specific denial of such a privilege without the consent of the municipal authorities:

"Any corporation organized under this article or under any general or special law of this state, for the purpose of using electricity for light, heat or power in cities, towns or villages within this state, may have and acquire the following additional powers, to wit: the power of supplying steam to consumers from a central station or stations through suitable pipes and conduits or other fixtures in, on and under the streets, avenues, public parks and places of such cities, towns or villages, *with the consent of the municipal authorities thereof and under such reasonable regulations as they may prescribe.*"

The following is the Ellsworth bill as amended to include cities of the first-class:

Section 1. Section 61 of Article VI of Chapter 566, laws of 1890, entitled "An act in relation to transportation corporations excepting railroads, constituting Chapter 40 of the general laws," is hereby amended by adding thereto the following additional subdivision:

4. Any corporation organized under this article or under any general or special law of this state for the purpose of using electricity for light, heat or power in cities other than of the first-class towns or villages within this state, may have and acquire the following additional powers, to wit: The power of supplying steam to consumers from a central station or stations through pipes laid in the public streets of the cities, towns and villages within this state, and for that purpose to lay, construct and maintain suitable pipes and conduits or other fixtures in, on and under the streets, avenues, public parks and places of such cities, towns or villages, with the consent of the municipal authorities thereof, and under such reasonable regulations as they may prescribe. For the purpose of acquiring the powers above specified any such corporation may make, sign, acknowledge and file in the same manner as an original or amended certificate of incorporation, a certificate stating that such corporation desires and intends to exercise the powers hereinabove specified. Upon the making, signing, acknowledging and filing such certificate, such corporation shall have and acquire for the purposes specified in such certificate all the rights, privileges and powers, and be subject to all the restrictions of district steam corporations, specified in sections 13, 14 and 15 of the business corporations law, being Chapter 691 of the laws of 1892.

Section 2. This act shall take effect immediately.

Columbus Street Railway.

The earnings of the Columbus, Ohio, Street Railway Company for the month of February were $52,697.20, an increase of $4,546.20 over the same month of last year. The increase in net is 45 per cent. Since January 1, 1899, the earnings were $110,689.31, an increase of $8,249.25, a net increase of 28.8 per cent over the same period for last year.

New Buildings of the General Electric Company at Schenectady, N. Y.

The already vast plant of the General Electric Company at Schenectady, N. Y., has now an addition of two of the largest and most perfectly constructed buildings for mechanical manufacturing purposes in the country.

The new iron foundry, a general view of which is given in the illustration herewith, which was occupied early in January, is of steel frame construction with side curtain walls of brick.

The capacity of the three "Calliau" cupolas of the foundry is 7, 11 and 18 tons respectively per hour, and there is ladle equipment up to 15 tons each. A feature of the equipment is the electrical facilities. Motors are used in direct connection for nearly every power feature. The cupola-blower, tumbler and wheels, cranes, of which there are seven, all have electric motors, 27 being used. The Buffalo Forge Company's machines are used throughout for the heating and ventilating, and so adapted as to make a most perfect system, both from a mechanical standpoint and that of the comfort of the men. In fact a large wing of the building has been provided with shower baths, conventional forms of hand bowls, individual lockers for the belongings of the men and other accessories. The cranes as arranged for operation are adaptable for use in all parts of the foundry and for handling loads in every direction. Six five-ton jib cranes, which are movable, have sockets for their reception in various locations and are so placed that the traveling may move the jib cranes; in addition are the following cranes: one 40-ton, two 10-ton, one seven-ton and three five-ton overhead travelers.

INTERIOR VIEW OF THE GENERAL ELECTRIC COMPANY'S NEW FOUNDRY AT SCHENECTADY, N. Y.

Main building—140 x 503 feet.

Cleaning-room wing—120 x 103 feet.

Large lean-to—38 feet 6 inches by 243 feet.

Small lean-to—11 feet 4 inches by 152 feet 4 inches.

Total floor area—93,900 square feet.

Height of side walls—23 feet 9¾ inches.

Height of gables (main)—58 feet 3 inches.

Height of gables (wing)—51 feet 8 inches.

Height of cupola-room wall—28 feet 8 inches.

Cubic contents—3,250,000 feet.

Weight of steel—1,200 tons.

Cubic yards concrete—1,833.

Cubic yards stone—1,203.

Number of bricks—1,350,000.

Cubic yards filling inside—27,000.

Cubic yards filling outside—53,000.

Square feet of window surface—12,286.

Square feet of skylights—23,336.

Capacity of sand sheds—6,000 tons.

Capacity of coke shed—600 tons.

The new machine shop is now being equipped with most modern machinery. This will be known as "Shop No. 9," and promises to be of general interest to the engineering and electrical field because of the many advantages it will have.

St. Louis World's Fair.

The city of St. Louis proposes to hold, in 1903, a universal exposition second to none in history, in commemoration of the centennial of the Louisiana Purchase. Five million dollars of stock, at $10 per share, is to be issued for popular subscription, the first payment to be five per cent, no subsequent call to exceed 20 per cent, and no two calls to be made within a single period of six months. All subscriptions are conditioned on an aggregate of at least $5,000,000.

At a meeting of representatives of the electrical industries in St. Louis a committee was appointed to canvass the electrical trades. It is likely that these trades will receive a large share of the support of the fair—the Chicago exposition having paid out no less than $2,500,000 for electrical features. Subscriptions and inquiries should be addressed to Mr. E. J. Spencer, chairman, 24 Laclede Building, St. Louis.

ADVANCE INFORMATION

New Telephone and Telegraph Companies.

GARNER, IOWA—The Garner Electric Light, Power and Telephone Company has been incorporated; capital, $10,000; incorporators, E. C. Abbey, Isaac Sweigard, J. N. Sprole and others.

WALSENBURG, COLO.—The Colorado Telephone Company has decided to run a telephone line from Walsenburg to Leveta.

LINESVILLE, PA.—The Linesville Telegraph and Telephone Company has been incorporated; capital, $6,000; incorporators, R. P. Reidenbach, F. E. Bunday, M. C. Robinson, C. S. Gehr, H C. Sturtevant, S. H. Wilson, J. A. Martin, all of Linesville.

ALMA, MICH.—The Union Telephone Company has been incorporated; capital, $25,000; incorporators, George Aldrich, St. Louis; G. S. Ward, Alma; James Getts, Ithaca; C. F. Brown, Alma; C. O. Trask, North Star.

LYONS, N. Y.—The Lyons Telephone Company has been incorporated; capital, $500; directors, S. E. Bishop and A. B. Bishop, of Clyde; E. G. Bishop, of Rhinebeck, and C. H. Towlerton, Calvin Hotchkiss, James Bashford and Clyde W. Knapp, of Lyons.

ANDERSON, IND.—The Anderson Telephone Company has been incorporated; capital, $50,000. The directors are George W. Beers, J. J. Netterville and R. H. Cokefair.

CHATTANOOGA, TENN.—The East Tennessee Telephone Company is extending its line beyond Whitesburg toward Bristol.

CHESTER, PA.—The Diamond State Telephone Company has completed its line to Harrington. The line now reaches Milford, Georgetown, Lewes, Laurel, Bridgeville, Frederic, Magnolia, Bowers' Beach, Felton and several other towns.

EDGERTON, MO.—The Platt Purchase Telephone Company has been incorporated; capital stock, $15,000. Incorporated by J. F. Boydston, H. H. and Holland Boydston and others.

DUNDEE, IOWA—The Bishop Telephone Company will extend their line from this place to Oelwein as soon as Spring opens up.

MCARTHUR, OHIO—The Chillicothe & McArthur Telephone Company has been incorporated; capital, $15,000; incorporators, Lewis S. Dane, Otto E. Vollenweider, Dennis Steele, Isaac M. Lantz, Henry S. Hamilton, David Will, all of McArthur.

TABLE ROCK, NEB.—The Table Rock Telephone Company has been incorporated; capital, $3,000; incorporators, W. C. Fellers, C. R. Judkins, C. J. Wood, of Table Rock, and others.

EVANSVILLE, IND.—The Evansville Telephone Company has been incorporated, with a capital stock of $150,000. The company expects to begin work on the plant the first of next month. Already 1,100 subscribers have been secured.

ELLSWORTH, ME.—The New England Telephone and Telegraph Company contemplates extending its lines on to Deer Isle.

GUEYDAN, LA.—The Johnson & Perkins Independent Telephone Company have completed their line from Crowley to this place.

NILES, MICH.—The City Council has granted a franchise to the Central Telephone Company, of Kalamazoo, to establish an exchange here. The rates will be $12 for residences and $18 for business houses.

SPARTA, MINN.—The Mesaba Telephone Company contemplates extending its line to McKinley and Biwabik and later on to Duluth.

MOUNT STERLING, OHIO—A new telephone company has been organized, with J. A. Miller as trustee.

New Incorporations.

TRENTON, N. J.—The Maritime Improvement Company has been incorporated with an authorized capital of $3,000,000. The company is authorized to construct canals, wharves, electric light and gas plants and put up telegraph and telephone lines. The incorporators are Charles H. Cramp, Philadelphia; Gustave Lindenthal, New York; Chauncey N. Dutton, Amzi L. Barber, New York; Charles G. Hill, Newark.

PITTSBURGH, PA.—The Faraday Carbon Company has been incorporated. Carbons for electric light and other articles for the production of electricity; capital, $1,000; incorporators, Daniel D. Dickey, James S. Humbird, Pittsburgh; John S. Crider, Allegheny; Washington H. Lawrence, Cleveland, Ohio; James Parmelee, New York city.

TRENTON, N. J.—The Columbia Automobile Company has been incorporated with a capital of $3,000,000. The company is authorized to manufacture and operate vehicles propelled by electricity, compressed air and other power. The incorporators are mainly New Yorkers.

NEWARK, N. J.—The Consolidated Electric and Photographic Supply Company has been incorporated to manufacture all kinds of electrical and photographic apparatus; capital, $100,000; incorporators, George G. Bliss, East Orange, N. J.; Frederick W. PePoin, Newark, N. J.; Charles E. Williams, Bridgeport, Ct.

MALONE, N. Y.—The High Falls Electric Company has been incorporated to produce electricity for public and private purposes; capital, $20,000; directors, Joseph F. Wright and Frederick O. Kilburn, of Malone, and J. Henry Abbott and Morton P. Abbott, of Gouverneur.

New Electric Railways.

STILLWATER, MINN.—Thomas Lowry and C. G. Goodrich have been granted a franchise or license to build a street railway in this city and to operate it for 25 years.

AKRON, OHIO—The Akron Traction and Electric Company has been incorporated. The incorporators are Aaron Wagoner, Frank A. Seiberling, L. C. Miles, Fred E. Smith and Ira M. Miller. The company is capitalized at $100,000.

COLLINSVILLE, MO.—The Secretary of State yesterday licensed the incorporation of the Collinsville, Caseyville & East St. Louis Electric Railroad Company, to build an electric railroad from Collinsville to East St. Louis; capital stock, $20,000; incorporators, Wm. G. Burroughs, Collinsville; W. H. Hueckel, Caseyville; D. M. Browning, Thomas L Fekete, F. J. Daniel, East St. Louis. The first board of directors is composed of Messrs. Burroughs, Hueckel and Browning.

HEMPSTEAD, N. Y.—The Nassau Belt Line Traction Company has been incorporated; capital, $300,000; incorporators, Henry L. Nichols, Hempstead; John W. DeMott Rockville Center; Wm. G. Miller, Freeport; Cuslin Cirnwall, Oceanside.

CANAL DOVER, OHIO—Plans have been projected for an electric railroad between Newcomerstown and Uhrichsville. Another new trolley line between Massillon and Canal Dover is also being planned.

HAGERSTOWN, IND.—The Town Council has granted an exclusive franchise to Kepler and Kenney to operate an electric line within the corporate limits; also to furnish electric light and power. Messrs. Kepler and Kenney propose constructing an electric line from Cambridge City to Economy, via this place.

COLUMBUS, OHIO—The Xenia & Wilmington Traction Company has been incorporated. with $10,000 capital stock, to operate a railroad between the points named, thence to Paintersville, Port Clinton, etc. Albert Emanuel, Frank S. Breene, Samuel A. Price, Henry B. Pruden and Harry A. Armstrong are the incorporators.

MUNCIE, IND. - Arrangements are being perfected for building an electric railway line from this place to Hartford City.

WHITE PLAINS, N. Y.—The trolley road will soon commence to build its extension from this place to Scarsdale. It expects to extend its line to Bronxville and East Chester.

BROADALBIN, N. Y.—A movement is under way for the construction of an electric railroad between this place and Amsterdam. Messrs. Charles and Seymour Husted, of Brooklyn, are interested.

Electric Light and Power.

PIERRE, IOWA—The Rhode Island Chemical Light, Power and Heat Company, with a capital of $1,000,000, has been incorporated; incorporators, John E. Van Peet, Albert Mullen and Rufus S. King.

WRIGHTSTOWN, PA—The Water, Electric Light and Sewer Company has been incorporated, with a capital of $5,000.

OURAY, COLO.—The Ouray Electric Power and Light Company, to operate in the city and county of Ouray, has been incorporated. The company is capitalized at $200,000. The incorporators are Charles H. Nix, Frank Sparks and John Doss.

PEORIA, ILL.—The People's Gas and Electric Company has been incorporated; capital stock, $500,000; incorporators, O. J. Bailey, Phila B. Miles and Sumner R. Clark.

PITTSFIELD, ME.—The Pittsfield Electric Light and Power Company has been organized for the purpose of generating and supplying gas or electricity, or both, with $50,000 capital stock. The officers are president, A. B. Locke, of Oldtown; treasurer, Frank L Smith, of Pittsfield. Certificate approved March 21

DES MOINES, IOWA—The Garner Electric Light, Power and Telephone Company has been incorporated. Its capital is $10,000. E. C. Abbey leads the list of stockholders.

HOBOKEN, N. J—The North River Light, Heat and Power Company will break ground at Fifteenth and Bloomfield streets in a few days for its new power-house. The plot was purchased from the Hoboken Land and Improvement Company for $17,500.

NORTH BEND, NEB.—The people of North Bend are agitating for a system of waterworks and an electric light plant.

SIOUX FALLS, S. D.—George Beardshear and Samuel Oliver, of Rapid City, have purchased the electric light plant at Sturgis.

ST. LOUIS, MO.—The Mountain Water Electric Power and Mining Company, with a capital stock of $5,000, has been incorporated by Paul A. Fusz, M. Rumsey, C. Iagels and L. M. Rumsey.

BELDING, MICH.—The Citizens' Light Company has been incorporated with a capital stock of $25,000. Directors are as follows: Maurice A. Reed, John Greenup and Frank R Chase.

RICHMOND, KY.—Ground has been broken for the new electric plant at this place, and electricity will be turned on by May 1. Rice & Harris, of that city, have the contract for building the plant.

Increase of Capital.

FRANKFORT, KY.—The Cumberland Telegraph and Telephone Company has increased its capital stock from $3,000,000 to $6,000,000.

PITTSBURGH, PA.—The Central District and Printing Telegraph Company has increased its capital stock from $3,000,000 to $4 000,000, to permit of the extensions and improvements contemplated by the company.